INDIAN ANTIQUARY
Third Series

STUDIES IN INDIAN ARCHAEOLOGY

PROFESSOR H. D. SANKALIA
FELICITATION VOLUME



Professor Hasmukh Dhirajlal Sankalia

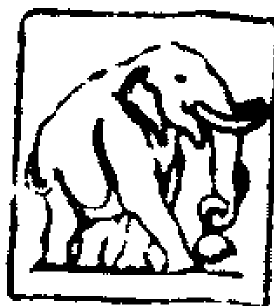
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Professor H. D. Sankalia Felicitation Volume

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INTRODUCTION

WHEN Dr. H. D. Sankalia attained 60 on 10th December 1968, we thought of celebrating his birthday. But, he being averse to such celebrations, we thought that the better way would be to bring out a Felicitation Volume to honour him. When we apprised him of this idea, he explained to us the difficulties in the publication of such volume, the cost involved and so on and so forth. However, we could not be deterred and we ultimately succeeded in persuading him; we told him that, being his pupils, we had every right to honour him. He graciously agreed to the proposal. We then forthwith formed a committee for the purpose. The committee consisted of the following members:

1. Dr. S. B. Deo (Chairman)
2. Shri S. N. Rajguru (Member)
3. Dr. Z. D. Ansari ,,
4. Dr. V. N. Mishra ,,
5. Dr. (Mrs.) Shobhana Gokhale ,,
6. Dr. G. G. Mujumdar (Treasurer)
7. Dr. M. K. Dhavalikar (Secretary)

The number of Dr. Sankalia's pupils, friends and admirers runs into a legion and they are spread not only all over the country but also in different parts of the world. It would have, therefore, been impossible for us to invite all the scholars associated with Dr. Sankalia to contribute papers for the Felicitation Volume. We had therefore to restrict ourselves only to his pupils. Accordingly we issued a circular requesting them to contribute a research paper as also Rs. 100/- each. We had specified a time limit and it was therefore possible only for some members to send in their contributions.

When the contributions and research papers started pouring in, the next step was to arrange for the publication of the volume. Since an independent volume was impossible within our limited resources, we approached Shri Ramdas Bhatkal of the Popular Prakashan, Bombay, and requested him to devote one volume of their INDIAN ANTIQUARY as *Professor Sankalia Felicitation Volume.* Shri Bhatkal readily agreed with us but wanted us to obtain the concurrence of Dr. G. V. Devasthali who is the editor of the journal. We are indeed happy to record that Dr. Devasthali agreed without any hesitation and the credit of the publication of the present volume goes, in no small measure, to Shri Bhatkal and Dr. Devasthali. We are grateful to both of them. Shri Bhatkal also

agreed to our request to assign the work to Shree Saraswati Mudranalaya, Poona, for the sake of our convenience. Shri M. S. Latkar of Shree Saraswati Mudranalaya, took up the work in all seriousness and assured us of its publication in time. We therefore record our sincere thanks to Shri Latkar for the printing of the volume in record time.

Many others have helped us in the preparation of the Volume. Among these we should thank the contributors without whose help this Volume could not have been brought out. For want of time, the proofs could not be sent to writers, particularly those outside Poona; they were corrected by Dr. M. K. Dhavalikar, Shri S. N. Rajguru, Dr. (Mrs.) Shobhana Gokhale, Dr. R. S. Pappu and Dr. M. L. K. Murthy. We thank them all for their ungrudging help. Shri S. N. Rajguru also helped us in various ways and we are therefore grateful to him.

We are deeply beholden to Sir Mortimer Wheeler for the foreword.

Lastly it may be stated that most of the papers, with a couple of exceptions, deal with different aspects of Indian archaeology and hence the title "Studies in Indian Archaeology".

We are conscious of the fact that this is ineed a small token of our gratitude to our Guru. But we do it out of heartfelt devotion to him for

Gururbrahmā gururvishṇurgururdevo maheśvaraḥ |
Guruḥ sākṣāt parabrahma tasmai śrī gurave namaḥ ||

S. B. DEO

M. K. DHAVALIKAR

FOREWORD

PROFESSOR H. D. SANKALIA

It is more than thirty-five years since I first met Professor Sankalia and had the pleasure of working with him on archaeological excavations in England. He was then, as he remains today, a quiet and dedicated student of the human achievement, and I regard it as a privilege to have this opportunity, with others, of expressing my admiration and affection for him in his unabated devotion to the science and art which I like to think that we share. In India on many occasions since 1944 he and I have met both at Poona and on some of the numerous sites which his work has made intelligible and indeed famous in the annals of archaeology; and as I write these words in my London study today I have on the shelves beside me half-a-dozen or more of his major writings. For amongst his many qualities he possesses the all-too-rare virtue of prompt and detailed publication, which has assured for him a lasting place of high distinction in his chosen branches of Indology.

Together with his many friends I wish him continuing success and happiness in the scholarly occupations in which he has for so long established an international reputation.

SIR MORTIMER WHEELER, F.B.A., F.R.S.

Secretary, The British Academy; formerly Director General of Archaeology in India, (1944-48).

London, 1970.

BIODATA

Professor Hasmukh Dhirajlal Sankalia

Born on 10th December 1908 (Bombay)

(a) Fellow, Jawaharlal Nehru Memorial Fund (1968-70)

(b) Professor of Proto-Indian and Ancient Indian History, Deccan College Postgraduate and Research Institute, Poona.

Academic qualifications and distinctions

M.A. (I class); LL.B. (Bombay);
Ph.D. in Archaeology (London).

1. Bhagwanlal Indraji Prizeman, Bombay, 1933.
2. Awarded Silver Medal for research by Royal Asiatic Society, Bombay in 1944.
3. Delivered Thakkar Vassonji Lectures, Bombay University in 1944.
4. Delivered Heras Memorial Lectures, 1960.
5. Delivered Bhagwanlal Indraji Lectures, Bombay University in 1960.
6. Delivered Thakkar Vassonji Lectures, Bombay University, 1965-66.
7. Awarded Gold Medal for the best work in Archaeology by the Gujarat Sahitya Sabha, Ahmedabad, 1967.
8. Delivered the Third Series of Lectures in the Rao Bahadur Gaurishankar Ojha Lecture series at Sahitya Sansthan, Rajasthan Vidyapeeth, Udaipur, 1969.
9. Delivered extension lectures at :
   (a) Kannada Research Institute, 1955
   (b) Panjab University, Chandigarh, 1960
   (c) Banaras Hindu University, 1965
   (d) Saugar University, 1967
   (e) Marathwada University, 1967
   (f) Nagpur University, 1968
10. Honorary Tagore Professor of Humanities, M.S. University of Baroda, 1963-64 and 1964-65, and as such delivered a course of 20 and 12 lectures

respectively on the Development of Civilization in India and Western Asia, and delivered the lecture on "Archaeology and the *Rāmāyaṇa*" in March 1970.

11. Awarded Dadabhoy Naoroji Prize for 1968.

12. Invited to lead the First Gujarat Prehistoric Expedition by the Director General of Archaeology in India in 1941-42;

Conducted the following archaeological excavations :

Maharashtra :

1. Kolhapur	1945-46
2. Jorwe	1950-51
3. Nasik	1950-51
4. Nevasa	1954-56 and 1959-61
5. Chirki	1969-70
6. Inamgaon	1969-70

Gujarat :

1. Langhnaj	1942-43, 1946-49, 1962-63
2. Akhaj	1947-48
3. Valasna	1947-48
4. Dwarka	1952

Madhya Pradesh :

1. Navdatoli	1953-54 & 1957-59
2. Maheshwar	1953-54
3. Tripuri	1966

Mysore :

1. Tekkalkota	1964
2. Sangankal	1965

Rajasthan :

1. Ahar	1962

Nominated as a member of :

(a) the Archaeological Delegation to the U.S.S.R. in 1963-64.
(b) Cultural Delegation to Yugoslavia in 1966.
(c) Government of India Delegation to the International Congress of Orientalists, Ann Arbor, Michigan, U.S.A., August, 1967.
(d) Advisory Editor of ***World Archaeology*** published by the Southampton University, U.K.

Membership of the learned societies :

i. Elected member of the Permanent Council of the International Congress of Prehistoric and Protohistoric Sciences, 1961.

ii. Nominated Honorary Member of Instituto Italiano Di Prehistoria E Protoistoria, Italy, 1962.

iii. Elected Honorary Fellow, Archaeological Society of India, 1968.

iv. Life Member of the Asiatic Society, Bombay.

v. Life Member, Bhandarkar Oriental Research Institute, Poona.

vi. Life Member, Linguistic Survey of India.

vii. Life Member and Chairman of the Archaeological Society of India.

viii. Member of the Advisory Board of Archaeology :

(a) Government of India since 1955
(b) Government of Maharashtra since 1955
(c) Government of Gujarat since 1964
(d) Government of Madhya Pradesh since 1966
(e) Government of Uttar Pradesh since 1969

Presided over :

(a) the Section of Archaeology and History — Gujarat Sahitya Sabha, Calcutta — 1961; and Gujarat Research Society, Ahmedabad-1963.

(b) First Maharashtra Itihas Parishad, Bombay, November 1965.

(c) Delivered the Presidential address at the inauguration of the Archaeological Society of India. Varanasi, 1968 and Patna, 1969.

(d) the Section of Prehistoric Industries in the symposium on "Homo Sapiens and Environmental Changes" organised by the UNESCO at Paris between 2nd-5th September, 1969.

Authorship of books, monographs, etc. :

1. *University of Nalanda,* (1934).
2. *Archaeology of Gujarat,* (1941).
3. *Investigations into the Prehistoric Archaeology of Gujarat,* (1946).
4. *Historical Geography & Cultural Ethnography of Gujarat,* (1949).
5. *The Godavari Palaeolithic Industry.* (1952).
6. *Pre- and Proto-history of Malwa,* (Deccan College, 1958).
7. *Indian Archaeology,* (1962).
8. *Prehistory and Protohistory of India and Pakistan,* (1962-63).
9. *Stone Age Tools, Their Techniques and Probable Functions.* (1964).
10. *An Introduction to Archaeology,* (1966)

11. *Excavations at Langhnaj,* (1966)
12. *Praāgaitihāsik Gujarāt* (Prehistoric Gujarat) in the revised edition of 'Glory that was Gurjara desh' in Press. Bharatiya Vidya Bhavan, (1968).

Joint author of the following reports on Excavations :

13. *Preliminary Report on the Third Gujarat Prehistoric Expedition,* (1945).
14. *Excavations at Kolhapur,* (1952)
15. *The Excavations at Nasik and Jorwe,* (1955).
16. *Excavations at Maheshwar and Navdatoli.* (1958).
17. *From History to Prehistory at Nevasa,* (1960).
18. *The Ancient Tambavati or the Copper Age City at Ahar, Udaipur,* (1968).
19. *Mesolithic and Pre-Mesolithic Industries from the excavations at Sangangallu,* Bellary 1965, (1969).

In Press :

20. *The Chalcolithic Village at Navdatoli.*
21. *Beginning of Civilization in Rajasthan* with an exhaustive bibliography by Kumari Dr. Malti Nagar.
22. *Archaeology and the Rāmāyaṇa* with an exhaustive bibliography by Shri S. N. Bhavsar.
23. *Prehistoric Technology* (to be published by the National Institute of Sciences in India).

Research Papers :

ARCHAEOLOGY-GENERAL

1. 1939 "Archaeological Exploration in Gujarat" *The New Review,* pp. 363-368.
2. 1940 "The Story in Stone of the Great Renunciation of Neminātha," *Indian Historical Quarterly,* Vol. XVI, 1940, pp. 314-19.
3. 1940 "Buddhism in Kathiawar," *Buddha Prabhā.*
4. 1942 "Cultural Significance of the Personal Names in the Early Inscriptions of the Deccan,". *Bulletin of the Deccan College Research Institute,* Vol. III, pp. 340-391.
5. 1943 "Notes on Cultural Geography and Ethnography of Gujarat," *Journal of the Gujarat Research Society,* Vol. V, No. 4, (Oct. 1943) pp. 1-3.
6. 1945 "A Brief Summary of Studies in Historical Geography and Cultural Ethnography of Gujarat, *Jr. of the Gujarat Res. Soc.,* Vol. VII, No. 4 (Oct. 1945), pp. 147-63.

7. 1946 "On the Origin of Gurjaras," *Journal of the Gujarat Research Society,* (April & July), pp. 1-6.

8. 1947 "The Antiquity of Glass Bangles in India", *Bulletin of the Deccan College Research Institute,* Vol. VIII, pp. 252-259.

9. 1947 "Origin of Bombay," *Journal of the University of Bombay,* Vol. XV, Pt. 4, (January 1947), pp. 1-4.

10. 1950 "Cultural Significance of Saddle Querns," *Journal of the Anthropological Society of Bombay,* (1950) pp.1-5.

11. 1953 "Man in the Arid and semi-Arid Regions of the Peninsular India," *Bulletin of the Deccan College Research Institute,* Vol. XVIII, pp. 123-136 (with Joshi, R. V.)

12. 1957 "Ṛṣaba or Ādinātha," *Jaina Antiquary,* March-April 1957.

13. 1957 "Saddle Querns and Stratigraphy," *Journal of Royal Asiatic Society,* pp. 209-12 (with S. B. Deo).

14. 1957 "Imported Mediterranean Amphorae," *JRAS,* 207-08.

15. 1958 "The Snake in Indian Mythology," *Bhavan's Journal,* Vol. V, No. 11 (Dec. 28, 1958) pp. 57-61.

16. 1958 "Houses and Habitations through the Ages," *Bulletin of the Deccan College Research Institute,* Vol. 20 (1-4), pp. 137-63.

17. 1960 "Lāṭa, Its Historical and Cultural Significance," *Journal of the Gujarat Research Society,* Vol. XXII, No. 4/88 (Oct. 1960), pp. 325-335.

18. 1962 "Archaeology of Poona and its surroundings", *38th All-India Medical Conference Souvenir* (Poona 1962), pp. 6-12.

19. 1962 "An Archaeologist's Suggestion to Universities." *Anthropology Exhibition Souvenir,* Social Science Association, Madras, July 1962, pp. 69-72.

20. 1963 "The Origin and Development of Writing", *Pushpanjali,* Vol. I, No. 1, Dec. 1963, pp. 95-98.

21. 1963 "Mahiṣmati and Maheshwar" *Journal of Indian History,* Vol. XLI, pp. 337-48.

22. 1963 "Archaeology and Tradition," *Indica,* Vol. I, No. 1, pp. 3-18.

23. 1963 "Report on Dwarka Excavations," *Times of India,* 19.5.1963.

24. 1963 "Dwarka in Tradition and Archaeology," *Times of India,* 2.6.1963.

25. 1964 "Antiquity of Modern Dwarka or Dwarka in Literature and Archaeology," *Journal of the Asiatic Society of Bombay,* (Dr. Bhau Daji Special Vol.), 1964, pp. 74-84.

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27. 1964 "Radio-carbon Dating in Archaeology," *Science Reporter*, Vol. 1, No. 10 (1964), pp. 358-61 and 367.

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30. 1966 "India's Language," *Times of India*, 3.5.1965.

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66. 1947 "They used brain surgery 10,000 years ago", *Continental Daily Mail*, Paris, 14.6.1947.

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70. 1953 "Ancient and Prehistoric Maharashtra", *Journal of the Bombay Branch of Royal Asiatic Society*, Vol. XXVII, Pt. 1, pp. 99-106.

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75. 1957 "Is Soan a Flake Industry ?", *Journal of Asiatic Society of Bengal* (Science), Vol. XXII, pp. 16-62.

76. 1958 "The Middle Palaeolithic Culture of the Deccan Karnatak and Central India", *Journal of the Palaeontological Society,* 1958. (with K. D. Banerjee).

77. 1958 "When Stone Age Man Lived near Poona ?", *The Times of India.*

78. 1962 "Prehistory and Archaeology in India", *Navroz Annual,* 1962, pp. 127-74.

79. 1963 "Stone Age Finds in Saurashtra : Link with Harappan Era", Times of India, 28.4.1963.

80. 1963 "Prehistory in India", *The Indo-Asian Culture,* Vol. XI, No. 3, (Jan. 1963), pp. 269-278.

81. 1963 "The Story of Man in Poona 1,50,000 years ago", *Times of India,* 26.4.63.

8. 1964 "Middle Stone Age Culture in India and Pakistan", *Science,* Vol. 146, No. 3642, pp. 365-75, Oct. 16, 1964.

83. 1965 "Prehistoric Migration in South India", *Times of India,* 28.3.1965.

84. 1965 "Early Stone Age in Saurashtra", in *Diputacion Provincial De Barcelona Institute De Prehistory Aracheologia,* Barcelona 1965 Monografiss XVI, pp. 327-346.

85. 1965 "Links with Stone Age near Bellary", *The Hindu,* 3.5.1965.

86. 1966 "Prehistoric Ahmednagar", *Studies in Indian Culture Dr. Ghulam Yazdani Commemoration Volume,* Ed. by Prof. H. K. Sherwani, Hyderabad, A.P. 1966, pp. 39-42.

87. 1966 "Early Stone Age in Poona", *Studies in Prehistory. Robert Bruce Foote Memorial Volume,* Ed. Sen and Ghosh, 1966, pp. 77-89.

88. 1966 "Sir Rustom and Research in Anthropology", *The Journal of Anthropological Society of Bombay* (New Series), Vol. XII, No. 1, 1966, pp. 56 ff.

89. 1968 "Beginning of Civilization in South India", *II Int. Conf. on Tamil Studies,* pp. 1-15 (separate brochure).

90. 1969 "Early Man in India", *JAS, Bombay,* 1966-67 (New Series), pp. 173-181.

91. 1966 "Prehistoric Man and Primitives in South Gujarat and Konkan", *Journal of the Anthropological Society of Bombay*, New Series, Vol. XII, No. 1, 1966, pp. 34-38.

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92. 1953 "Archaeological Sequence of Central India", *South-western Journal of Anthropology*, Vol. 9, No. 4 (1953), pp. 343-356. (with S. B. Deo & B. Subba Rao).

93. 1953 "Excavations in the Narmada Valley", *Journal of the M.S. University of Baroda*, Vol. II, No. 2, (Oct. 1953).

94. 1955 "Navdatoli Dancers", *Antiquity*, Vol. XXIX, pp. 28-31 (March 1955).

95. 1955 "Spouted Vessels from Navdatoli (Madhya Bharat) and Iran", *Antiquity*, Vol. XXX, pp. 12-15 (June 1955).

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No.	*Year*	*Name*	*Title of the thesis*
1.	1944	D. R. Patil	Cultural History from the *Vāyu Purāṇa.*
2.	1947	A. V. Naik	Archaeology of the Deccan.
3.	1949	B. Subba Rao	Prehistoric and early historic Bellary.
4.	1952	S. B. Deo	History of the Jaina Monachism — From Inscriptions and literature.
5.	1952	G. A. Deleury	The Cult of Vithobā.
6.	1953	R. V. Joshi	Pleistocene Studies in the Malaprabha Basin — Prehistory and Geochronology.
7.	1954	Mrs. Sumati Mulay	Studies in the Historical and Cultural Geography and Ethnography of the Deccan.
8.	1957	K. D. Banerjee	Middle Palaeolithic Industries of the Deccan.
9.	1957	M. S. Mate	Maratha Architecture (1650-1850).
10.	1958	B. N. Chapekar	Iconographical Elements in the *Mahābhārata.*
11.	1958	A. P. Khatri	Stone Age Cultures of Malwa.
12.	1960	Z. D. Ansari	Geometrical approach to Prehistoric and Ancient Indian Pottery.
13.	1960	Mrs Shobhana Gokhale	Studies in the Historical and Cultural Geography and Ethnography of Madhya Pradesh.
14.	1960	N. Isaac	Stone Age Cultures of Kurnool.
15.	1960	C. G. Mohapatra	Stone Age Cultures of Orissa.
16.	1961	K. R. Kapre	Archaeology of the Ancient Place Names in the Deccan.
17.	1961	V. N. Misra	Stone Age Cultures of Rajputana.
18.	1962	K. L. Lele	Studies in the Historical and Cultural Geography and Ethnography of Rajasthan.
19.	1963	Mrs. Madhur Mohini Mathur	Studies in the Historical and Cultural Geography and Ethnography of U.P.

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20.	1963	M. K. DHAVALIKAR	Life in the Deccan as depicted in the Ajanta Paintings.
21.	1963	P. R. SHARMA	Archaeology of Nepal.
22.	1965	SURESH B. PILLAY	Historical and Cultural Geography and Ethnography of South India.
23.	1965	R. SINGH	Palaeolithic Industries of Northern Bundelkhand.
24.	1966	NISAR AHMED	Stone Age Cultures of the Upper Son Valley.
25.	1966	R. S. PAPPU	Pleistocene Studies in the Upper Krishna Basin.
26.	1966	M. S. NAGARAJA RAO	Chalcolithic Cultures of the Deccan with special reference to North Karnatak.
27.	1966	S. N. RAO	Stone Age Cultures of Nalgonda District (A.P.)
28.	1966	M. L. K. MURTY	Stone Age Cultures of Chitoor District (A.P.)
29.	1966	MISS MALATI NAGAR	Ahar Culture -- An Archaeological and Ethnographic Study.
30.	1968	S. G. SUPEKAR	Pleistocene Stratigraphy and Prehistoric Archaeology of the Central Narmada Basin.
31.	1968	K. PADDAYYA	Pre- and Proto-historic Investigation of the Shorapur Doab.
32.	1968	K. THIMMA REDDY	Prehistoric Cultures of the Cudappah District (A.P.).
33.	1968	S. N. TIPNIS	Contribution of Upāsani Bābā to Cultural Life of Maharashtra and India.
34.	1969	P. B. GADRE	Cultural Archaeology of Ahmednagar during Nizam Shahi period.
35.	1969	MRS. OMI MANCHANDA	Study of Harappan Pottery in comparison with Pre-Harappan and Post-Harappan Proto-historic Ceramic industries.
36.	1969	A. SUNDARA	Megaliths in North Karnatak.
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STUDIES IN INDIAN ARCHAEOLOGY

PEBBLE TOOLS FROM NITTUR (MYSORE STATE)

Z. D. ANSARI

THE VILLAGE of Nittur is situated (Lat. 15° 32′ N. Long. 76° 53′ E) 3½ miles west of Tekkalkotta, on the right bank of river Tungabhadra in Bellary District, Mysore State. During the excavation period at Tekkalkotta in the year 1964, Prof. SANKALIA advised the writer to carry out a survey of the river Tungabhadra in the vicinity of the excavated site. It resulted in the discovery of a site yielding an industry comprising exclusively pebble tools recalling the typical Sohan types. The importance of this site is also due to the fact that along with the stone tools, fossilized animal bones, mostly of ***Bos namadicus*** have been recovered for the first time in the southern part of the peninsula. Hitherto, in the Indian sub-continent, an Early Stone Age industry with a predominant pebble tools component is known only from the Sohan Valley of the north west Punjab; however, pebble tools displaying technological similarities to those of Sohan are known to form a negligible percentage in the handaxe-cleaver dominated peninsular Early Stone Age industries. It is only in the Kurnool District of Andhra Pradesh (a handaxe-cleaver province) that pebble tools are known, to date, representing 40 per cent of the total industry. In this material culture context that indicates the technological emancipation of the Early Man, a study of the Nittur pebble tool industry is most important for an understanding of the prehistoric cultural growth in this country.

River Tungabhadra rises in the western ghats at Gangamula in the Chikmangalur District, and flows in the north easterly direction for about 400 km. passing through Harihar, Hospet and Sirguppa. Then it flows out of the State. At Kurnool it joins river Krishna forming its southern or rightside tributary. The Tungabhadra itself has some streams like Varda, Chinna, Hagri and Vedanti (Hagari) as its tributaries.

Geologically the region around Nittur belongs to archaen complex, which represents one of the oldest recognizable group of rock formations. The archaen system is classified into two main divisions, namely (i) the Dharwar System and (ii) the Peninsular Gneisses.

The Dharwar system is made up of a complex series of crystalline foliated fine grained schists and is often associated with phyllites, naematic quartzites and epidorites. The exposures of this system are very few in the region under consideration.

The rocks of peninsular gneissic group occupy almost whole of the region around Nittur. These rock types are referred as "Bellary gneiss" or 'Hospet granites.' Petrologically the rocks are grey to pink in colour, corase to medium grained in texture, and contain quartz, felspar, mica, and iron ore as constituent minerals. These rocks are characterized by peculiar exfoliation weathering and typical joint pattern which have given rise to fantastically designed cones, bosses, etc. A number of dolerite dykes are found to traverse through the archaeans. Around Nittur, dyke material has been used as raw material in preparing most of the Early Stone Age and Middle Stone Age tools. The siliceous materials such as chalcedony, chert, etc. are of rather rare occurrence.

The survey of the river Tungabhadra was confined to the right bank of the river to a length of few furlongs near the village of Nittur. The sections on this bank are about 4.50 m. in height from the river bed. They reveal a layer of pebbly gravel about 35 cm. thick which is covered by sub-recent dark-brown silt. Most of the components of the pebbly gravel are fairly rolled. Wherever the overlying dark-brown silt has been eroded, the pebbly gravel horizon is exposed quite extensively in the adjacent fields. From this gravel were recovered Middle Stone Age tools.

The area between the section and the water course is full of loose bouldery gravel of various materials whose accumulation might probably have taken place because of rock barriers in the course of the river which is otherwise mature. This gravel seems to have been eroded *in situ* and could not be transported because of rock barrier downstream. It is in this loose bouldery gravel that a large number of fossils — vertibrae, skulls, horns, etc. were found embedded in siliceous fine grained sand, silt and calcium carbonate, lying in the upstream on the same bank. Majority of tools came from the loose and partly eroded gravel. The tools were made mostly on trap material such as dolerite, amphibolites, epidiorits or some basic rocks. Some of the tools show a high degree of greenish, yellowish weathering. There were a good number of pebbles having such patina on their surface. Few tools were found to have been made on quartzite, banded haematite quartzite.

Two silts could be distinguished : Red kankarised old silt and the black silt (sub-recent). Black silt sometimes capped the red silt and sometimes rested against it.

There appear to be two phases of stone ages typologically and to some extent stratigraphically, but no clear stratigraphic evidence is there.

Early Stone Age

The most important feature of the Early Stone Age industry is that broken pebbles have been utilized with minimum of artificial shaping. Pebbles have been chipped off the naturally or intentionally broken portion, generally unifacially and sometimes bifacially. The cortex of the pebble is retained at the butt, while only the working edge is flaked. Majority among the tools is of choppers. Their working edge is achieved by striking a few flakes from the pebble surface from one side and sometimes from both.

In all 31 tools of Early Stone Age were collected. They are grouped according to working edges in the following categories.

A	UNIFACIAL CHOPPERS — TOTAL		11
	1	with pointed working edge	2
	2	with straight working edge	2
	3	with convex working edge	6
	4	with concave working edge	1
B	BIFACIAL CHOPPERS — TOTAL		13
	1	with convex cutting edge	5
	2	with working edge all round the periphery	2
	3	with cleaver-like cutting edge	1
	4	with flat based steeply worked all round the periphery	5
C	FLAKES — TOTAL		2
	1	Pebble and flake	1
	2	End flake	1
D	REJECTS — TOTAL		5

Out of the total 31, 10 typical specimens are described and illustrated.

A. UNIFACIAL CHOPPERS

A unifacial chopper made on a flat-based dolerite pebble with pointed tip: The point has been achieved by working on either side of the point only on the convex side of the pebble. The flake scars are almost fresh. The pebble is flat at the butt. The under surface has one deep flake scar which appears to be accidental and non-functional. (NTR-2, Fig. 1, No. 3).

A unifacial chopper with straight working edge on an elongated flat based pebble of black basalt/dolerite: One of the longer sides is flaked with mostly step-flakes and few deep and shallow flake scars removed from pebble surface. It is a side chopper. The butt end is flat while the portion at the shorter side shows battering marks indicating that the pebble was used as a hammer

before making it into a chopper. It is almost in fresh condition. (NTR-6, Fig. 1 No. 9).

A unifacial chopper made on a split pebble of dolerite of tabular shape : One of the longer sides is steeply flaked from pebble surface to form a convex cutting edge. A few step flakes are seen in fresh condition. (NR-52. Fig. 1 No. 5).

A unifacial convex sided chopper made on a roughly oval shaped pebble of banded chert with one of its shorter sides flat : The working on both the longer sides is done by deep flake scars removed from pebble surfaces. It is almost fresh. (NTR-26. Fig. 1 No. 4).

A unifacial chopper with concave cutting edge made on an oval pebble of brown quartzite with one of its surfaces flat : The concave cutting edge has been achieved first by three deep flake-scars and then by retouch along the hollowed edge. The flakes have been removed from pebble surface. It is almost in fresh condition. This type of tool is rare in Early Stone Age. (NTR-23. Fig. 1 No. 6).

B. BIFACIAL CHOPPERS

A bifacial chopper of medium size with convex cutting edge made on a basalt pebble : Cutting edge is achieved by alternate flaking on almost 2/3 of its periphery. The butt retains cortex. The specimen is very much weathered. (NTR-58. Fig. 1 No. 10).

A bifacial chopper with convex zig-zag cutting edge made on a flattish round pebble of basalt : Wavy cutting edge is obtained by the intersection of alternate large and deep flake scars struck from the surface of the pebble, two on one side and four on the other. One large and deep flake at the butt portion probably for handling is removed. Condition is fresh. (NTR-1. Fig. 1 No. 1).

A bifacial chopper with working edge all round the periphery, made on a pebble of black quartzite : One side is characterized by large shallow centrally directed flake scars meeting at a humped point. The other side retains cortex in the centre and is steeply flaked showing deep flake scars. It is in fresh condition. (NTR-59. Fig. 1 No. 2).

A bifacial chopper with cleaver-like straight and sharp cutting edge : It is made from a pebble of basalt. The butt portion is 'U' shaped. Working is confined to the cutting edge. It is a pseudo-cleaver. Almost fresh. (NTR-41. Fig. 1 No. 7).

A bifacial chopper with flat base, made on a split pebble of basalt : Flat base shows some deep flake scars. Using the flat portion as the platform a series of steep vertical flakes have been removed. The cortex is retained in the centre. Fresh. (NTR-61. Fig. 1 No. 8).



Fig. 1

Middle Stone Age

There appears to be some genetic relationship between Early Stone Age and Middle Stone Age tools at this place as the tools of both the groups are made on pebbles retaining pebble cortex on large portions.

Out of 37 tools collected, only 7 are selected for description and illustration. The entire collection is grouped and classified as under :

A SCRAPERS—TOTAL	12
1 Convex Scrapers All are made on pebbles or flat nodules.	6
a Unifacially worked	4
b Bifacially worked	2
2 Round Scrapers—Total All are made on flat nodules or pebbles.	6
B. POINTS—Total	4
Unifacial	1
Bifacial	3

All are made on flat pebbles or nodules.

C. LEVALLOISIAN CORES—Total 3

All are on flat pebbles.

D. FLAKES—Total 18

All are primary end flakes and unworked. Out of these 3 are slightly worked.

SCRAPERS

A convex sided scraper on a quartz split pebble: The working edge is produced by the removal of shallow and broad flakes on side. Working edge is slightly zig-zag. Semi-rolled. (NTR-68. Fig. 2, No. 7)

A convex sided scraper on a nodule of brown banded chert: The convex working edge is achieved by intersection of small shallow flake scars from both sides. The working edge is slightly zig-zag. One of the sides retains cortex showing white patina. Semi-rolled (NTR-39. Fig. 2, No. 3)

A round scraper on a red chert pebble : The working edge on almost all along the periphery is achieved by irregular alternate shallow flakes. One flake scar shows step-flaking. Semi-rolled. (NTR-40. Fig. 2, No. 2)

A round scraper made on a pebble of red banded chert : Two-third of its periphery is worked by removing deep flake scars producing a zig-zag cutting edge. Step flakes are formed due to the composition of the material. Semi-rolled. (NTR-70. Fig. 2, No. 6)

POINTS

A unifacial point made on a split pebble of chert : The point is achieved by flaking on the split-side. The other side is cortex except a few flake scars. Semi-rolled. (NTR-29. Fig. 2, No. 5)

A point made on a split pebble of yellow banded chert by flaking shallow and step flake-scars on either side of the point...One of its sides bear cortex; semi-rolled. (NTR-36. Fig. 2, No. 4)

LEVALLOISIAN CORE

A levalloisian core with its periphery which shows centrally directed flake scars which were removed before the detachment of the central flake. Other side retains cortex and periphery is characterized by deep flake scars removed in order to prepare a round scraper. Semi-rolled. (NTR-28. Fig. 2, No. 1)

Conclusion

The study of the Tungabhadra valley near Nittur, has brought to light the existence of Stone Ages (both Early and Middle) in that region. The fossil mammalian bones have been discovered for the first time in Andhra-Mysore parts of the Deccan. Even though Early Stone Age industry could not be

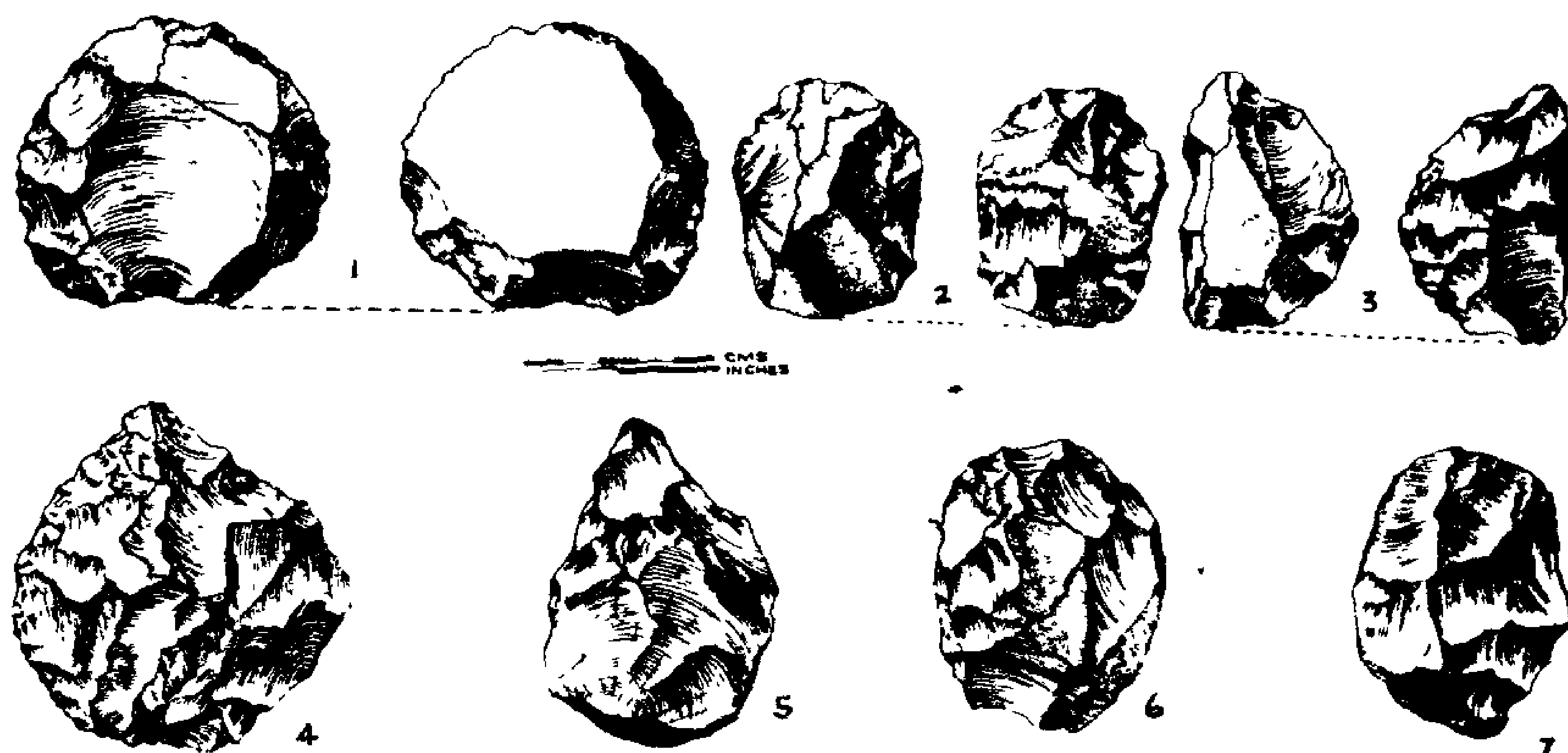


Fig. 2

placed in the proper time-scale of the Pleistocene due to lack of proper stratigraphy, the Middle Stone Age tolls should fall into the latter part of the Pleistocene on stratigraphical grounds. However, much more exensive survey of the valley is necessary for better chronology of various Stone Age industries found in this area.

On typological grounds the presence of pebble tools is very interseting. Their occurrence, rather in isolation, in handaxe-cleaver complex zone of Andhra-Mysore region requires careful examination in future; for they display the same technology of flaking upwards from below of either a naturally available flat-based pebble or a split pebble. Such tools are described by Paterson and Movius as choppers which are most frequent in Sohan industry of Punjab. At this junction one may recall the hypothesis put forth by SANKALIA (1963, p. 276) that there might be a possibility for the independent origin of pebble tools at Kurnool, as they share a major representation (about 40 per cent) in the total assemblage. The present evidence from Nittur adds some more weight to his observations, and it might become now necessary to review the validity of the previous hypothesis that the Indian subcontinent can be demarcated into two major provinces dominated by (i) the pebble tool complex in the north-west and (ii) a hand-axe cleaver complex in the peninsula. The archaeological evidence gathered during the past decade has also disclosed that pebble tools do occur in many of the sites yielding typical Acheulian industries though not in the same frequency as in the Punjab.

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EARLY STONE AGE SITE AT MANEGAON ON THE PURNA RIVER, JALGAON DISTRICT, MAHARASHTRA STATE

B. P. BOPARDIKAR

A DETAILED study has been undertaken of the Purna river, a tributary of the Tapti river flowing through the Districts of Amraoti, Akola, Buldhana and Jalgaon in Maharashtra State, with a purpose of exploring geology, morphology, Stone Age stratigraphy and industries. The initial survey in the upper reaches of this river valley around Amraoti and Akola Districts, has revealed the existence of Middle Stone Age and microliths at Rithpur, Brahmanwada, Wisroli Kural, Tuljapur Garhi, Walgaon. Few animal fossils including that of *Bos* were also collected at Sangavi, Mungsi and Yelki. The entire middle and upper valley is heavily silted and at few places, sections of the gravel etc., above the river bed are visible. A considerable portion of the deposits appear to be of Pleistocene Age. The lower course near the confluence of this river with the Tapti near Edlabad has an interesting Stone Age site yielding Early, Middle and Late Stone Age tools.

Geology

The geology of the Purna basin is comparatively very simple as it involves few rock formations, which differ in geological age. There are few isolated patches of Gondwanas, Lametas and Laterites, occurring towards the north-eastern boundary of the Purna Valley. The major geological formations in this region are of Deccan Trap and Alluvium. There is a faulting along the scarp to the north, north-east of Ellichpur and it runs along east-north-east to west-south west with a considerable down throw of 2000 ft. towards the south.

Drainage System[1]

The Purna river originates in the southern slopes of Gawilgarh hills north of Brahmanwada. It is a major tributary of the Tapti. It flows from the hill to the south of Brahmanwada in southernly direction and then south-east of Daryapur, it suddenly takes a sharp bend to the west flowing through the Districts of Amraoti, Akola, Buldhana and Jalgaon, and finally discharges in

the Tapti near Changdev.[2] Morphological studies of the Purna river reveal that the Purna Alluvium occupies a trough caused by the warping of the Trap. Subsequent to or contemporaneous with the warping there was a big fault along the northern edge of trough near the base of Sapura.[3]

Site

Manegaon lies between long. 20° 04′ N and lat. 76° 01′ E; (55 C/4) and is situated to the north- northwest of Edlabad, a town in Jalgaon District of Maharashtra State (Fig. 3). The river Purna flows to the north of Manegaon in east to north-west direction to join the Tapti near Changdev. Numerous southern affluents like Gang Nala, Darka Nala join the Purna around Manegaon.

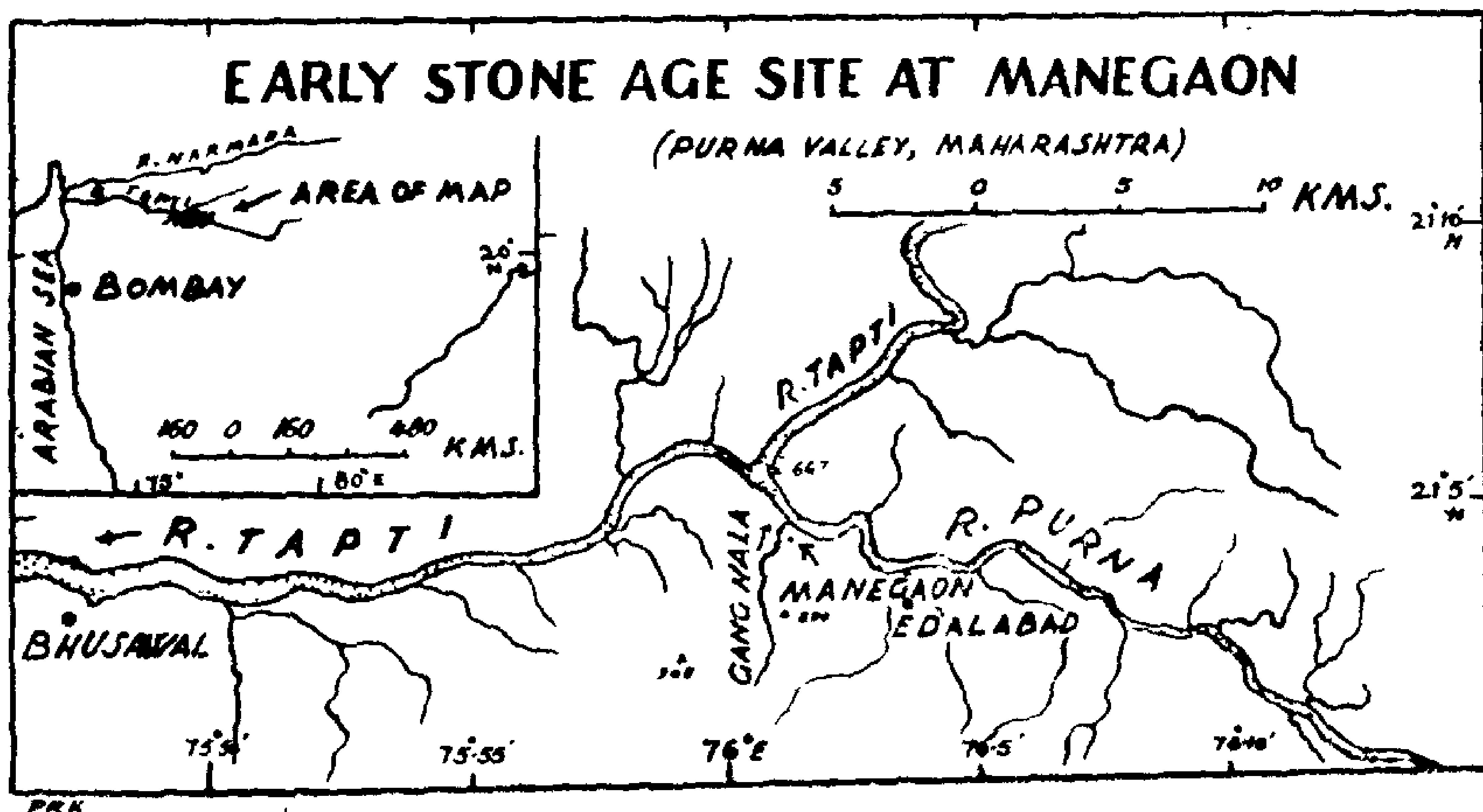


Fig. 3

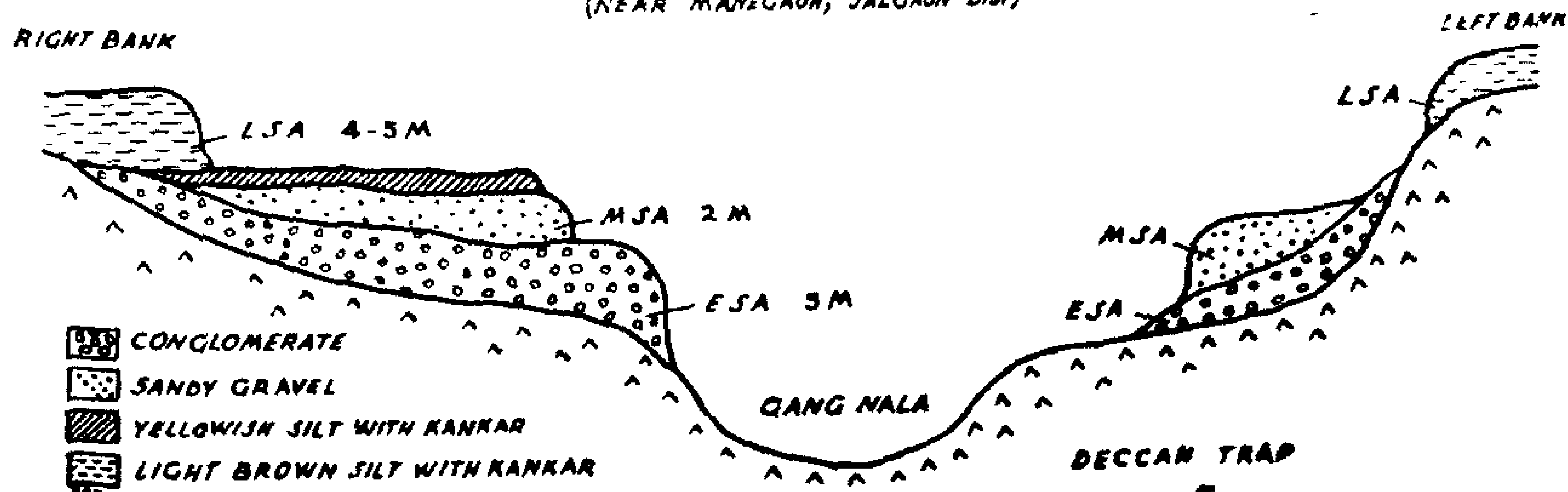


Fig. 4

While examining one of the nalas locally known as Gang Nala around Manegaon, an interesting Stone Age site was discovered. It is a very small

nala of about six to seven miles in length from its source to the confluence with the Purna on the left bank. The Gang Nala rises in the Salalparda hills in the reserved forest at an height of 300m. SL. There is a fall of 90m. in its entire length. The left bank of Purna near its confluence with Gang Nala presents a three level aspect (Fig. 4). The topmost level is made of light brown silt with calcareous nodules and yields microliths on chalcedony. The intermediate level, about six meters above the river bed is marked by sandy deposits yielding Middle Stone Age artefacts, while the lowest level consists of highly cemented pebble conglomerate containing Acheulian implements of Early Stone Age. The basal conglomerate rests on the Deccan Trap. (Pl.Ia). These levels may not justify their designation as terrace levels, unless similar features are observed in other parts of the Purna Valley. The whole sequence of deposits perhaps indicates a continuous deposition and the present configuration imparted due to the erosion caused by the nala.

Stone Age Industry

The three different levels on the right bank of Gang Nala near the road yielded industries of Early, Middle and Late-Stone Age. From the highly cemented pebbly bed Acheulian artefacts were recovered. The tool types comprise of ovates, cleavers made on flakes, flakes and cores, the chief raw material being the trap rock. These tools are slightly rolled and a few are patinated.

Although the total collection is no more than twelve to fifteen artefacts, all are found within the gravel bed. No handaxe was found during the present exploration. There are, however, two ovates both of which are illustrated. The cleavers appear rather crude in form with thick and asymmetrical cross-sections. The form, technique of flaking and condition of the tools point rather to Early to Mid-Acheulian character.

Few Early Stone Age artefacts have been described below :

A OVATE 105 × 86 × 26 mm.

1 A flake from prepared core is taken and worked mostly in one direction around the periphery. The outline is slightly almond. Fully flaked on the front while the underside is a plain flake surface with a small bulbar scar. Section lenticular, slightly rolled and patinated (Pl. Ib, 1).

2 126 × 95 × 34 mm.

Made on an end flake. The tool is pointed ovate with a symmetrical body, worked all along the periphery alternately. Heavily rolled and patinated with brown encrustation. Section biconvex. The tool is made on trap (Pl. Ib, 2.)

B CLEAVERS :

1 132 × 85 × 54 mm.

Made on a side flake, sides are little convex and show alternate flaking.

Butt is 'U' shaped and thick and alternately flaked. Cutting edge straight and short. Section is somewhat plano-conxev. The tool is slightly rolled and made on grey trap (Pl Ib, 3).

2 134 × 88 × 36 mm.

On a side flake with rhombic outline. Butt thin, cutting edge is almost straight and oblique-broken. Marginally worked; Section roughly parallelogramatic. Made on trap flake, little rolled. (Pl. Ib, 4).

3 130 × 64 × 40 mm.

A 'V' shaped cleaver made on a side flake. Butt pointed and sides flaring, cutting edge straight and broad. The flaring sides have been worked alternatively. Section parallelogramatic (Pl. Ib, 5).

C FLAKES :

1 110 × 72 × 22 mm.

A substriangular end flake of grey trap. The platform is slightly oblique making an angle of 110° with the primary flake surface. From the upper surface few flakes have been removed for making a point. There is a slight depression on the upper surface, near the platform. Under surface shows that the bulb is diffused due to the removal of two flake scars. Secondary working is along the margin. Slightly rolled and patinated. Section triangular near the tip. (Pl. Ib, 6).

2 112 × 68 × 28 mm.

Subtriangular end flake of grey trap. The plain platform makes an angle of 98° with the primary flake surface. Two small and one large flakes taken near the tip. Slightly retouched along one of the margin. It is slightly rolled and encrusted with lime. Section triangular near the platform. (Pl. Ib, 7).

During the same exploration few tools of Middle and Late Stone Ages were also collected from the sandy gravel (Fig. 4) and from the topmost yellowish brown silt, but they have not been dealt with in this paper. The Middle Stone Age tools are mostly points and scrapers and all are fashioned on chalcedony and cherty material. The yellowish brown silt has also yielded few blades, scrapers and fluted cores made on chalcedony. A good number of Middle and Late Stone Age factory sites were also discovered in the vicinity of Manegaon, and Edlabad.

ACKNOWLEDGEMENT

I am thankful to P. R. K. PRASAD for preparing line drawings for this paper.

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THE ACHEULIAN WORKSHOP AT CHIRKI ON THE PRAVARA RIVER, MAHARASHTRA

Gudrun CORVINUS

THE ACHEULIAN site Chirki on the Pravara was discovered in 1963 during a geomorphological survey of the Pravara river valley. The writer undertook this study on the advice of Sankalia of the Deccan College. Acheulian hand-axes and cleavers had been found around Nevasa earlier, especially during the excavation seasons at Nevasa. SANKALIA and his colleagues found during that time tools near Hathi Well and Loc. I, a mile upstream from Nevasa, as well as loose in the river bed. Sankalia, therefore, suggested to the writer a survey of the entire Pravara valley with particular emphasis on the geomorphology of the area. It was during this survey that the writer came upon the Acheulian factory site at the confluence of a small tributary, Chirki, with the Pravara, 2 miles downstream from Nevasa. But it was only in 1966 that she decided to excavate the site, when a grant-in-aid from the Wenner

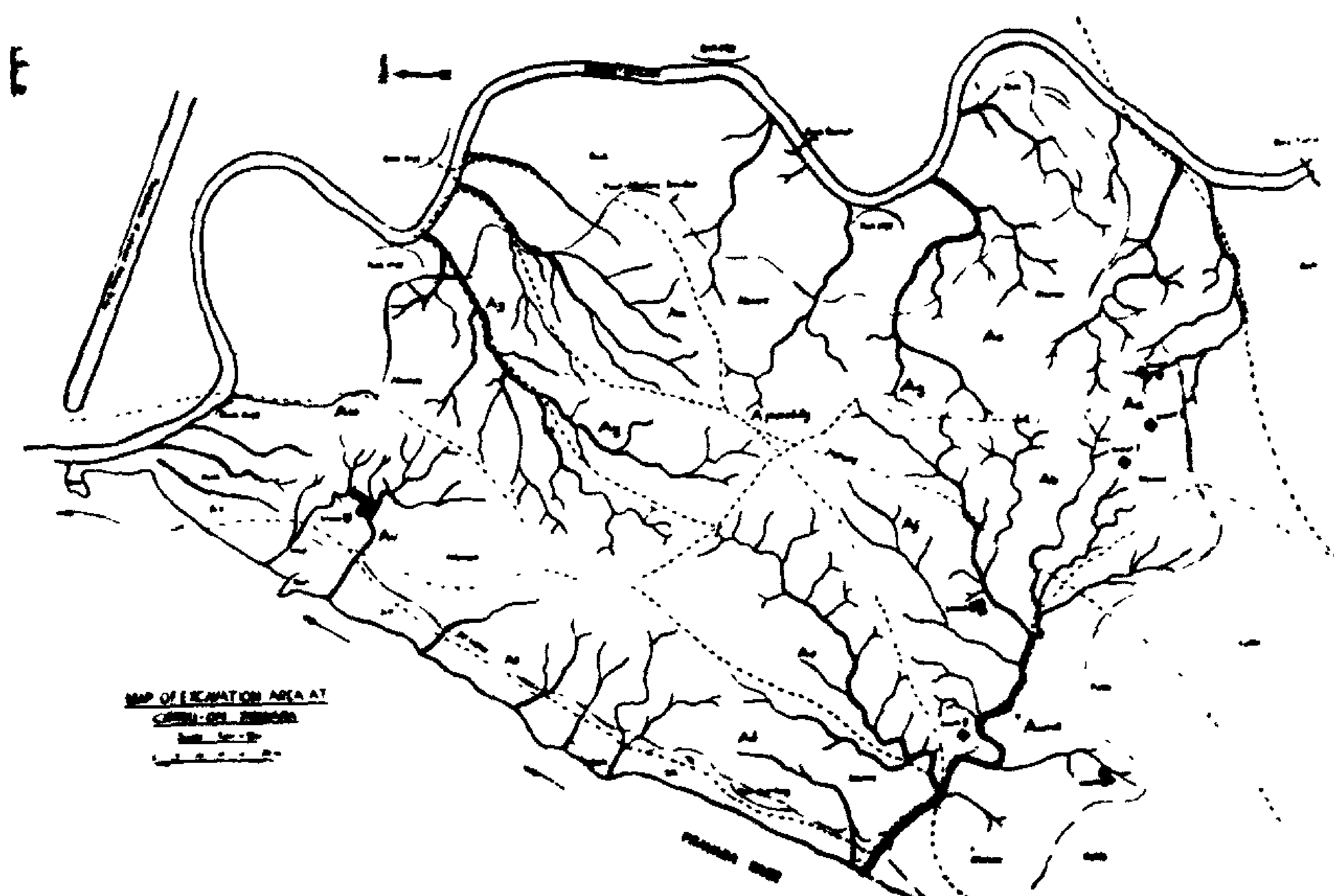


Fig. 5a

Gren Foundation was offered as well as a scholarship in the scheme "Exploration of Early Man", from the Council of Scientific and Industrial Research, Delhi. through the kind help of M. R. SAHNI, Lucknow. The excavations went on for 3 Winer seasons, from 1966 to 1969.

In the first year's dig, the stress lay on finding the horizon of the Early Stone Age tools, as well as of the Middle Stone Age industry or the Nevasian, so termed after Sankalia first found it near Nevasa.

The Early Stone Age tools had been found as surface tools in the gullies of the Chirki area. This area consists of bad lands, cut into young Pleistocene gravel alluvium. The tools were eroded out from this alluvium. The first 6 trenches did not reveal any Early Stone Age (E.S.A.) horizon. The trenches were cut into the alluvium, which at places was 8 m. thick, overlying rock. Middle Stone Age (M.S.A.) tools were found dispersed throughout the gravel. It was in trench VII that at the end of the first season a very rich E.S.A. horizon was uncovered. 74 mtrs of the horizon were exposed and 694 E.S.A. tools recovered from a rubble boulder horizon, which was sealed by the above mentioned alluvial gravel (Fig. 5a). The rubble horizon was 20-40 cm thick, overlying the bedrock of trap basalt (Fig. 5b).

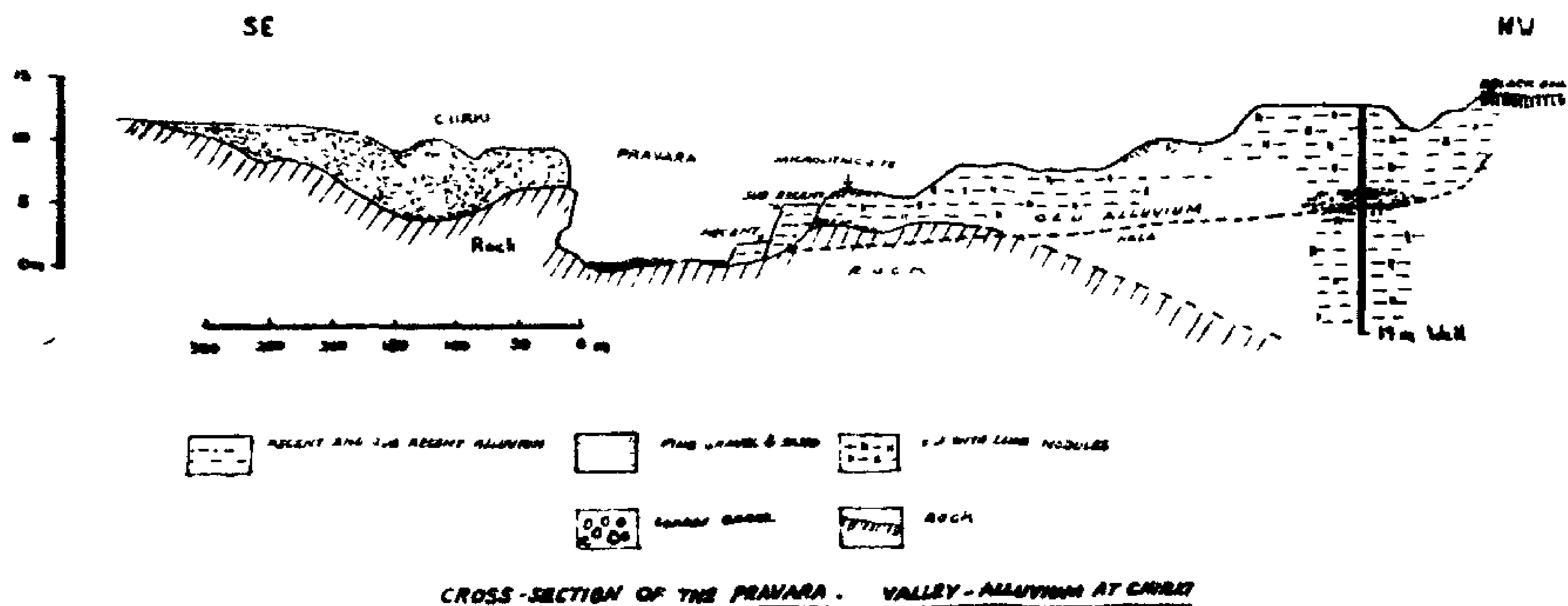


Fig. 5b

The second season was used to extend Tr. VII and to open Tr. IX and XII in two other areas of surface concentration of tools, as well as a number of trial trenches to find out the extent of the rubble horizon. Tr. IX revealed also an Acheulian horizon, sealed by gravel. Tr. XII was half a mile away from VII and revealed a filled-in Pleistocene gully with E.S.A. material of only a few finished tools but many small and large flakes and waste. A factory site must have been nearby and the artifacts subsequently thrown or washed into the ancient gully. The filling is completely unsorted and unstratified, looking much more like the debris of a pit, than of a natural infill. The surrounding of Tr. XII is quite rich in surface tools.

In the third season, the aim was to find the extension of the tool concentration of Tr. VII. Trs. A-F were opened around VII. Besides this a number of trial trenches were dug to ascertain the various rock depths and the various levels of the boulder cum artifact horizon in the Chirki area (Tr. XIV-XX). Tr. XIII was dug in an area where a great numbei of fossil wood pieces and several tree trunks were found in the alluvium.

A. The Environment

The excavated area consists of alluvial bad lands on the right river bank of the Pravara. The undulating bedrock level underneath the alluvium is a few meters higher than in the present river bed. The deepest rock levels are encountered on the other bank of the river, where the bedrock is at places at least 7 m. lower than in the present river bed. This was the ancient, subsequently buried, valley of the Pleistocene Pravara.

The age of this ancient, buried valley does not seem to correspond with the age of Early Man living at Chirki. Early Man of the Acheul horizon lived, when the river had begun filling its deep eroded valley and had changed its course towards SW, i.e. towards Chirki, where it cut a slightly inclined rock terrace. Into this slightly inclined rock terrace with its irregular undulations and water-marked depressions an interrupted layer of a bouldery rubble horizon was laid down, more by lateral contribution from the very neighbourhood than by river action. An interfingering with fluviatile boulder gravels can be seen at XX, near the recent river bed. Early Man occupied this surface, which might have been affected only by higher floods.

He used the material which was available in the rubble for the manufacture of his tools. The rubble gave him the supply of different materials, i.e. of a grey, compact Trap basalt and a red, often amygdular basalt. Both these basalt types are present in the immediate neighbourhood. This fact and the angularity of the red boulders (the grey basalt weathers spheroidally) suggest that the boulders are derived from the erosion of the bedrock. Fine grained dolerite boulders, of which Man made a number of his best tools, must have been brought in by Man. A few dyke outcrops, a few miles away from Chirki, are the source of this material. He also used chalcedony and quartz for tools of Acheulian type.

Man certainly lived in this area, though he did not live on the boulder-horizon itself, but in the immediate neighbourhood. He must have camped on the flat surface of the banks of the valley and must have used the bouldery terrace as his factory site to manufacture his tools there from the available boulders. No trace has been found of a camp site. It might be possible that the strong erosional forces have destroyed everything which hight have been present on the valley flats. These flats, now barren and rocky in many places and covered

at other places with a thin black soil on which millet grows, must have carried at the time of Early Man an extensive, though thin forest. The findings of calcified wood, and a few tree trunks and branches, which had been washed into the alluvium, proves the existence of such a forest even at the time of the sealing of the occupational level.

That the excavated site, especially around Tr. VII, was a factory or workshop of Early Man is made clear by several facts. First of all, the vast amount of artifacts found together suggests a factory. The angularity and sharpness of many tools show that no transport could have taken place. Then we find a very large number of unfinished artifacts and large flakes, waste flakes and flakes with little work as well as pebbles with little work. In fact the largest percentage of the assemblage is not of finished tools but of waste and unfinished tools. Unfortunately, however, the amount of small dressing flakes is not large as one should have expected. Finally a number of large cores has been found, most of them in Tr. B (6 pieces) and a few in adjoining E. This suggests that a centre of detaching large flakes from large cores must have been in B and E.

All this goes to show that the workshop of the Chirki Man must have been right here. He must have carried the tools he needed up to his living site.

As I said before, the boulder workshop must have been only occasionally subjected to flooding in years of heavier floods at the time of Man's occupation, so that only slight disturbances occurred in the original position of the artifacts. Some artifacts are, however, more rounded than others. These varying degrees of rounding can only be explained by a time difference of exposure. That transport and rolling had nothing to do with the degree of rounding is clearly shown on an artifact, which was found on the surface. The lower surface of this tool, which was fixed in the sediment, reveals a much sharper preservation of the edges than the upper surface, which was exposed for a long time to the action of wind and rainwash and is very rounded.

Man must have left this place when the boulder horizon was flooded by the rising river and sealed by the alluvial gravel, which covers the whole area of investigation, filling the rock-boulder-terrace up to about the level of the lateral valley flats.

Occasional occurrences of E.S.A. tools in the gravel can be explained as follows : they must have been washed into the gravel from higher lying rock exposures, on which they got deposited during the time of the Chirki Man. It seems that at the time of occupation the whole rocky surface of the area was strewn with artifacts. At several trial trenches a tool or two were found right on the rock without the intervening boulder horizon. Wherever one encountered the boulder horizon in a trial trench, one could be almost sure

to find a tool or two. That means that the whole, rather undulating, rock and boulder surface underneath he alluvium was occupation floor.

The alluvial gravel which seals the E.S.A. horizon contains another industry, the Nevasian, made of chalcedony jasper, etc. It is a flake industry with scrapers, borers, points, some of them well retouched. The bulk of the artifacts is, however, unworked flakes, chips, cores and slightly worked pebbled. This industry was found in great abundance on the surface, where they got concentrated as the larger components of the sediment as a result of vertical sheet erosion.

In the excavations, this industry was found everywhere in the gravel without being fixed to any horizon. They were even found on the surface of the boulder horizon and inside it. They must have penetrated into the boulder horizon together with the gravel at the the same time of flooding and sealing.

The question now arises where to place this industry in regard to the Acheul industry. Is it a later, different industry ? That would mean a long gap of time between the Acheul and the Nevasian, which cannot be proved geologically. There is no hiatus between the boulder horizon and the gravel.

Or could the Nevasian be possibly contemporaneous with the Acheul industry ? A number of the small basalt flakes look very similar to those of the Nevasian. And there is a large number of small cores in the Acheul industry which suggests that the Acheul man used small flakes detached from them. These cores are often prepared and show 1-3 platforms. The technique, thus, of manufacturing a "light duty" flake industry was known.

There is certainly a relation between these two industries, probably a development from one to the other. Man must have realised that the silica material is much better fitted for the manufacture of the light duty flakes than the basalt. On the other hand he used sometimes quartz and other silica for his pebble-handaxes—never for his cleavers, of course. This also explain the non-existence of a unconformity between the two horizons of boulders and gravel.

B. The workshop

The assemblage of the Acheulian industry consists of 2050 artifacts, i.e. of 1511 tools (unfinished and finished), 95 cores, 444 waste. (There will be more cores after the detailed analysis is completed, because I am sure that a number of the so called polyhedrons are cores.) The most evident grouping would be into pebble tools and flake tools. One could also group them into a handaxe and a cleaver group, yet it would be confusing as handaxes are made from flakes as well as from pebbles. Besides there are too many transitions between handaxes, reduced cleavers and several subgroups, that it is easiest to classify them first into a flake group and a pebble group.

The pebble group consists of :

1	Handaxes (picks, pointed axes, ovates, borers etc.)		330
2	Unifacial choppers	}	546
3	Bifacial choppers		
4	Polyhedral choppers		
5	Backed choppers		
6	Discoidal choppers		
7	Polyhedrons		
8	Spheroids		
9	Hammerstones		
10	Cores		95
			971

That means

1	A handaxe group	(330)
2	A choper-polyhedron group	(546)
3	A core group	(95)

The handaxes are made from elongate pebbles or from split pebbles, with alternate flaking and with secondary flaking at the point and the edge. The butts, specially of the picks, are thick and blunt, often unworked or only partly worked. The flaking is done by stone hammer technique and controlled flaking. The tools of the chopper-polyhedron group are usually made from the spheroidally weathered cores from dyke-or compact grey basalt blocks. Such naturally rounded pebbles are easily available. By multi-directional, polyhedral flaking around the whole surface or part of the surface, they receive their shape of various forms. The polyhedral flaking is rather shallow, (in the cases of spheroids and polyhedrons) and sometimes deep (in the case of some choppers). The unifacial choppers are mostly side choppers. The bifacial choppers are mostly end choppers or round choppers.

Polyhedral choppers have several irregular edges, running in different directions. Sometimes one edge is pronounced. Sometimes all edges join into a small point. The edges can be quite sharp but are usually rather short and shallow. They have often an unworked, round butt.

Backed choppers have a blunted back with two secondary edges running parallel to each other, leaving a vertical butt-plane between them. They have usually a more pronounced chopping edge.

Discoidal choppers : They are sometimes difficult to distinguish from discoidal cores. However, they have a zig-zag edge running all around the tool and are flatter than polyhedral and backed choppers.

Polyhedrons are tools which have a polyhedral flaking around the whole circular surface of the pebble with short, rather shallow edges and no butt. The edges are in some cases sharp enough for cutting or piercing. But usually they are too shallow for any cutting work. What function they had is difficult to say.

Spheroids are very regularly rounded tools, covered all over by small shallow flakes.

The cores are either irregular shaped cores, with flakes struck from any suitable flat part of the core, or they have one or several prepared platforms which are either parallel or vertical to each other. The detached flakes are small and shallow. These cores are meant for the manufacture of small flakes of which there are quite a number in Chirki.

The flake group group consists of :

1	handaxes	186
2	cleavers + intermediate forms of various cutting tools as : cleavers with lateral cutting edge, reduced cleavers with lat. edge, points with lat. edge	382
3	scrappers, knives, chisels, borers	66
4	worked flakes	276
5	waste flakes	48
6	cortex flakes, dressing flakes, light duty flakes	152

All the flakes and flake tools, apart from the light duty flakes and dressing flakes as well as cortex flakes, are made in a very distinct, unchanging fashion. Over 90 per cent of the flakes are side struck. Only a few are endstruck or obliquely struck.

It is of a great advantage to us that a number of large cores have been found which show clearly the way the core was prepared and how the flakes were then detached in such a way that the result was an elongate sideflake with a cleaver edge. This cleaver edge was not always successful and sometimes not even intended. The cleaver edge, afterwards, was not necessarily kept, but was often reduced or removed in order to get a chisel-like end or a point with a lateral, sharp edge. There is especially one large, fine core, which shows well the technique applied by man. It is a large, prepared core with a flat base. This base seems to originate from splitting a huge block in two halves. The base is slightly curved. The basal edge which runs all around the core, then, is worked : flakes are removed along this edge, vertical from the flat base. Thus, the vertical flanks of the core show an alignment of flake-scars, which later on constitute the upper surface of the detached flake. A strong blow on the flat base near the basal edge will, then, detach the intended

flake, in such a way that the intended cleaver edge is towards the maker and the thicker butt end is away from the maker, while the flake surface is on the left. The angle from the platform to the flake surface is about 110°. The platform was usually unprepared before detachment. But after detachment the platform-remnant on the detached flake (which will be now called talon, according to Bordes) will be worked either partially towards the butt to remove the sharp-angled upper edge of the talon, or fully in order to flatten the tool. The talon is in most cases on the right side of the tool. This right side will be always the steeper side of the tool. The left side, which must have tapered out, was, then, worked unifacially or bifacially to produce a flat, sharp edge. The cleaver edge, usually broad and straight or broad and oblique in the beginning, was often reduced slightly from the left edge to produce the desired length of the cleaver edge.

If the maker, however, wanted to have a different tool than a cleaver, he usually concentrated on the cleaver edge to alter the tool. He would reduce the cleaver edge either from the left side by lateral flaking so that the cleaver edge merged into the side edge, thus producing a cleaver edge, or he would reduce the cleaver edge from the right side, thus making a sharp-angled chisel end or borer. Or he would give a few, small transversal flakes at the cleaver edge itself, destroying the straight edge, leaving a central point. Or he would remove the cleaver edge altogether by transversal and lateral trimming so that the end result is a flake-handaxe. In this case he might flatten the steep, right side, too. In this way he shapes a great variety of different tools from the same original cleaver-sideflake.

The butt, too, was often carefully worked, mostly by alternate, bifacial flaking to produce a zig-zag edge. Or he would blunt the butt. In the case of flakes with what I call a 'Kasescheibe' (cheese-clice) section, the detached flake was situated at corner of the core, so that the butt is part of he prepared flanks of he core.

An interesting observation in regard to the manufacture of the side-flakes is very flatness of their flake surfaces. It might be possible that the detaching of the flakes was done after heating the core in the fire, so that the flakes detached easily and flatly. However, I have not done any experiment on this.

C. *The Living Site*

The technique shows that Chirki Man had clear idea of his tool requirements and of the way to produce these tools.

Altogether we can distinguish three different types of manufacture for his required tool kit:

1 The side-flake-tool group (cutting tools).

2 The pebble or split-pebble tool group of picks, pointed hand-axes (tools probably for piercing etc., perhaps for killing ?)

3 The pebble-tool complex of choppers and polyhedrons (probably for chopping, cracking bones, etc.)

Thus the tool kit reveals the main activity of the Chirki Man at his living sites: that of cutting. We can be without doubt that such cutting was connected with his food habits. There are scarcely any tools which suggest that they were used as weapons to kill and hunt animals. He must have hunted the animals either by trapping or with a different set of tools, of which we have no remains.

He must have brought the hunted animal to his camp site at Chirki, where the tools were ready for skinning, dismembering and cutting the animal. The large side scrapers with the merging cleaver edges would be ideal for skinning the carcass. Such activity would not leave distinct use--marks on the edge. The fact is that we do not find any distinct usemarks on the scrapers and knifes. But we find a lage percentage of cleavers having heavy usemarks at the cleaver edge. These cutting tools, then, must have been used for cutting up the carcass, cutting bones and tendens and dismembering the animal.

The pebble tool complex of choppers may, then, have been used for cracking and smashing the bones to get the marrow, especially the polyhedral choppers with their short, blunt edges. Some of the unifacial and bifacial choppers could have served, also, as cutting tools. What purpose the polyhedrons and spheroids might have had, is quite difficult to say; perhaps for smashing, pouncing, rubbing or perhaps for hiding skin, or perhaps as stone hammers.

The group of long pointed picks and pointed handaxes is quite a separate group and seems to have nothing to do with the cutting tools. They might not have been used at all for any work which was connected with the carcass. An interesting observation in the cutting tool group is that a few of the tools seem to have been manufactured and used by and for the left hand, as their cutting edge is at the right, when one holds the tool with the cleaver edge or point upwards, which is the opposite edge than usual. One could argue that one could use the tool also in the right hand, so that the flake surface is held as the upper surface, or so that one holds the point or cleaver edge downwards. But the fact remains, that these tools are not as comfortable in the right hand as they are in the left hand. Some of the broad, large cleavers migh have been hafted, though the majority of the cleavers must have been held directly in the hand.

Not many bones have been found at the site. Only a few fragments of bones and teeth of *bos* and *elephas* as well as a tusk of *elephas* and a horn was found on the boulder horizon. This seems to be in accordance with our assumption that the excavated area was a factory site. The dismembering of the hunted

At Tekwada also, except the Black-and-Red ware with typical megalithic shapes and graffiti, no other traits are noticed. There is also not much mention of any remains of megalithic funerary architecture or monuments in the Tapti-Girna Valley except at Ranjala and Tekwada. The so-called dolmens at Bhosari near Poona are of a dubious archaeological value as they may represent more the continuation of the megalithic architectural form rather than the spirit. As the explorer has pointed out, even now some pastoral communities in the area worship a symbolic deity enshrined in the dolmen. As such, such an evidence has not much been archaeologically eloquent as it has not yet given us any data in the form of material equipment which betrays clear megalithic traits as known from Tekwada, for instance, or elsewhere.

Against this background of the contact between the chalcolithic painted pottery using people and the megalihic folk as suggested first at Tekwada, the evidence from some of the sites in the Vidarbha region assumes a signal importance.

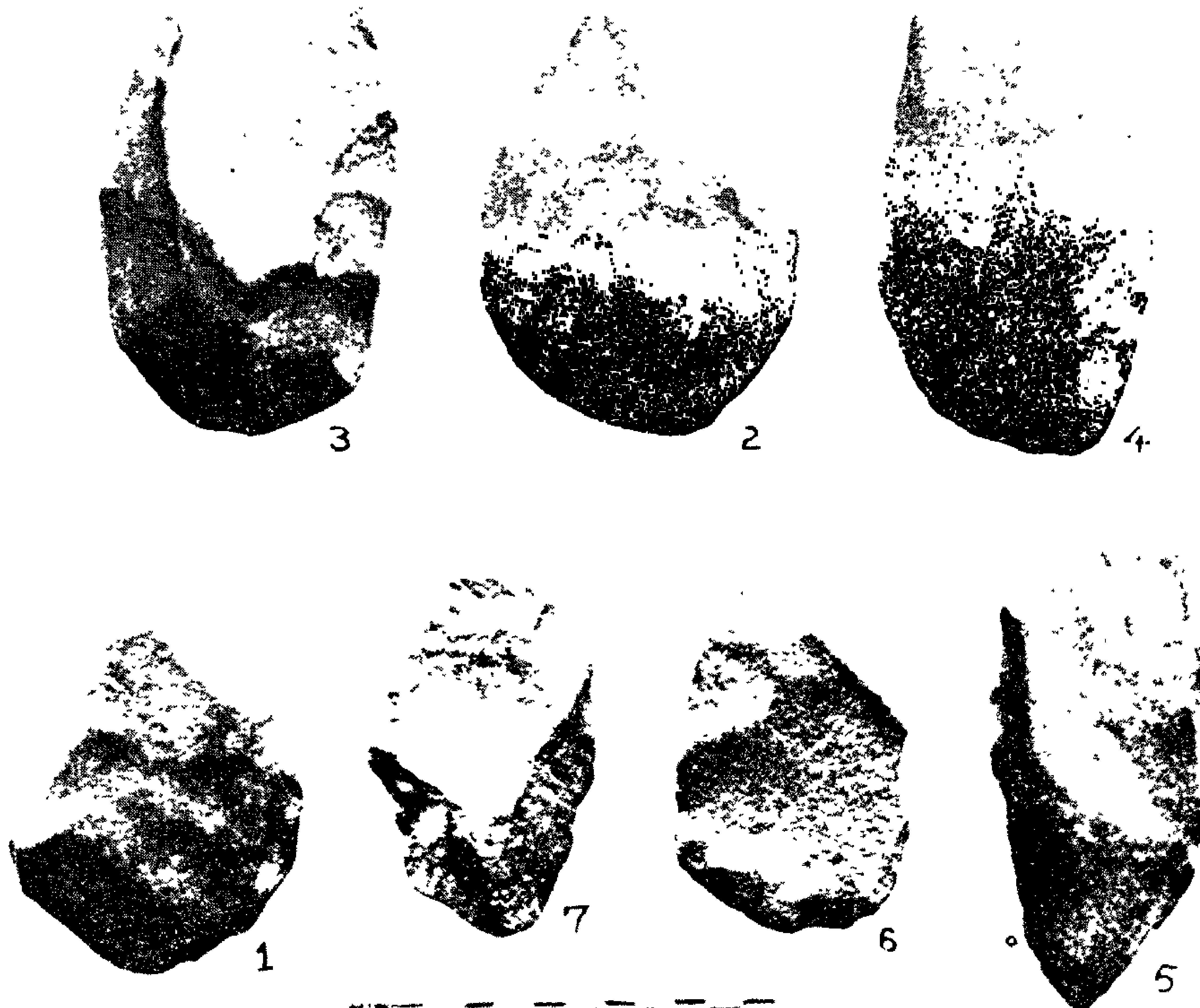
The provenance of the Stone Circles shows that they are concentrated in the eastern districts of Vidarbha, i.e. Bhandara, Nagpur and Chanda which are surrounded by the nearby regions of the States of Madhya Pradesh and Andhra Pradesh which also have numerous Stone Circles and other monuments of the megalithic tradition. No such monuments have so far been reported in western Vidarbha. However, the penetration of the megalithic cultural elements as far west as Tekwada in Khandesh holds out possibilities of locating such data even in western Vidarbha.

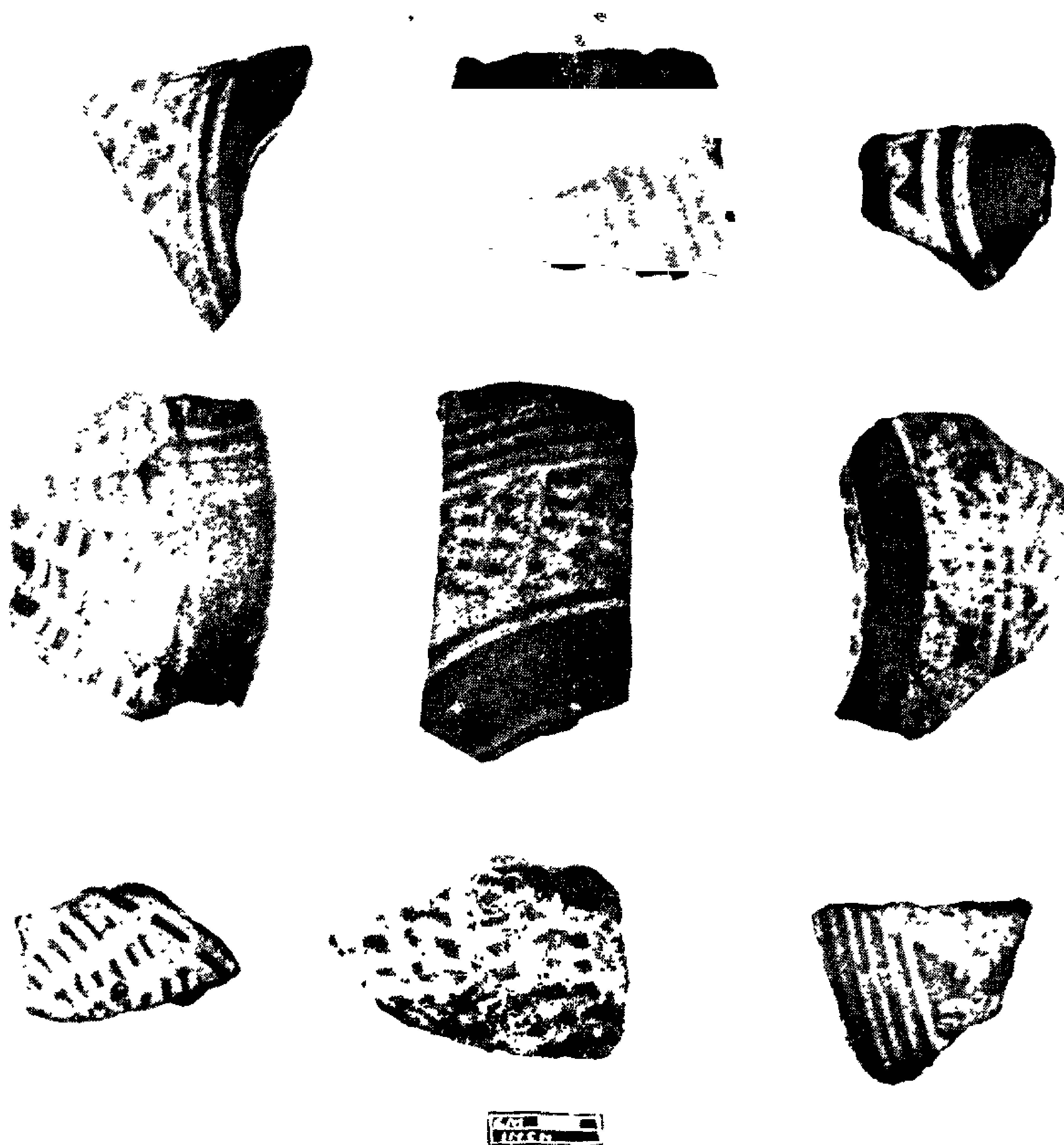
As stated above, the region of eastern Vidarbha abounds in Stone Circles. It is also well known that at Junapani and Mahurjhari near Nagpur are reported largest concentrations of these. At the former place there are as many as 300 Stone Circles, while at Mahurjhari there are well over 150 Circles. Besides these two, there are a number of other sites which have Stone Circles. Some of these were noted and a few excavated as early as a century ago by Major Pears and Hunter. However, no scientific accounts of these are available. and whatever data is described is devoid of the understanding of its cultural significance. Thus, though tapping the megalithic remains in Vidarbha had been undertaken fairly early, the cultural implications of these were not properly assessed.

The cultural implications of the data from the Stone Circle sites as also others have assumed new dimensions in recent years. As stated above, the excavations at Kaundinyapur, Paunar, Takalghat and Khapa have yielded material which throws new light on the archaeological personality of Vidarbha and the repercussions of the megalithic contact on it.

The data on this aspect of cultural dynamics was first tapped unmistakably at Kaundinyapura and Junapani, the first a habitational site occupied right

Pl. Ia : Conglomerate on the right bank of Gang Nala





Pl. II : Painted sherds from habitation, Takalghat

upto the medieval times, and the latter entirely a Stone Circle site. The evidence, as will be stated below, was rather complimentary in some respects, though no Stone Circles have been reported from the vicinity of Kaundinyapura.

The excavations at Kaundinyapura[1] have revealed the existence of the earliest habitation which has been designated by the excavator as of "Megalithic Period". It was characterised by the black-and-red pottery, etched carnelian beads with typically southern or megalithic decorative patterns, a micaceous red ware and a few painted black-on-red ware sherds. The proportions of these ceramic industries are not known nor are the typical megalithic shapes worked out. As is well known, the megalithic black-and-red has a distinctive finish and characteristic typological range. It appears that the painted black-and-red is different from that encountered at Tekwada where the Jorwe painted fabric was evidenced. Moreover, the micaceous red has not so far been reported anywhere in regions west of Vidarbha. Thus, the nature of the earliest habitation at Kaundinyapura had its own distinctions in the form of a micaceous red ware, a black-and-red ware devoid of large scale megalithic shapes, a distinctive painted black-on-red ware different from the Chalcolithic painted ware and a range of etched beads with megalithic decorative patterns. Thus this assemblage seems to present the existence of a new cultural personality symbolised by a painted pottery unknown from the megalithic and non-megalithic eastern and western sectors on the flanks of Vidarbha.

The dating proposed for this, however, appears to be rather liberal for it is assigned to about 2000 B.C. on stratigraphic consideration. As explained by the excavator this "megalithic period" or "megalithic phase" comes right over the black cotton soil. The deposits of this phase are superimposed by another deposit of the black-and-red. Then comes a sterile horizon over which came the habitations of the NBP-using people. Taking into consideration the date of the NBP, the sterile horizon and the deposit capping that of the earliest horizon, the latter is put to about the 2nd millennium B.C. If this date is accepted then it will mean that megalithic cultural inroads in Vidarbha could be pushed back to this date. This is rather difficult to accept as the existence of megaliths, even in the pronouncedly megalithic zone of the south, has not so far yielded any evidence of such an antiquity.

The excavations of the Stone Circles at Junapani[2] yielded evidence which corroborated the material culture of occupation I at Kaundinyapur. These gave black-and-red pottery, the micaceous red, and a solitary evidence of "a bowl with hole-mouth spout" bearing linear paintings in black. The excavator has not elaborated the affinities, if any, of the fabric with the so far known painted fabrics either from Kaundinyapura or elsewhere.

spearheads, dagger heads, barbed arrow-heads, swords, spikes, etc. The more
The other funerary equipment recovered from the Stone Circles comprised

iron artefacts and etched beads. Among the former may be mentioned spears, daggers, arrowheads etc. some of which have their parallels at Kaundinyapura. Among the latter are etched carnelian beads whose decorative patterns are not dissimilar to those recovered in the megalithic phase at Kaundinyapura. Similar is the case of the copper bell with iron tongue which was found both at Junapani and Kaundinyapura. This parallelism in the material equipment at Junapani and Kaundinyapura cannot be studied in totality as the full report of the excavations at Junapani is not yet out. However from whatever data has been published, it is abundantly clear that there appears to have been an inherent identity of material culture between the Stone Circles at Junapani and the habitation of the earlier phase at Kaundinyapura. This identity is all the more amazing when it is taken into consideration that there are no Stone Circles near Kaundinyapura and there is no habitation site near Junapani.

These factors showing a co-mingling of the megalithic tradition and the painted pottery tradition is further attested at Paunar which was excavated in 1967 solely to attest its Vakataka potential.[5] However, the evidence of the pre-Vakataka levels gave a new data for the Wardha region. There the earliest habitational deposits were characterised, like Kaundinyapura, by the use of the black-and-red pottery, some bearing graffiti, the painted black-and-red were, the micaceous red and the coarse red ware. All these were the same as reported from Kaundinyapura and Junapani, thus bespeaking a cultural link between these three sites.

The painted pottery of this earliest habitation at Paunar showed a few variations in fabric. However, none of the fabrics showed any genetic relationship with the painted pottery fabrics of the chalcolithic horizons in the rest of the Maharashtra region. The shapes, the fabric and the paintings are also different. This implies that whereas the Tekwada megalithic came in contact with Jorwe ware, in Vidarbha the megalithic folk encountered another painted pottery tradition which appears to have been current, at least on the present showing of the evidence, to be the distinctive feature of the Vidarbha region.

This distinctive feature in relation to the megalithic habitation and the Stone Circles was finally confirmed by the excavations at Takalghat and Khapa, some twenty miles due west of Nagpur.

On the basis of the knowledge of the context between the painted pottery, the micaceous red, the black-and-red, the etched heads and the distinctive iron objects reported from Kaundinyapura, Paunar and Junapani, the twin sites of Takalghat and Khapa were explored in 1968. It was very encouraging to note that these two sites are situated on either bank of the river Krishna, and whereas Takalghat had a habitational mound rising to a height of about 8 metres, there were a number of Stone Circles at Khapa. The surface collec-

tion indicated that Takalghat mound might yield in a stratigraphic context the wares like the black-and-red, the micaceous red and the painted black-on-red (Pl. II) as reported earlier at the three sites mentioned above. The surface collection at the Stone Circle site at Khapa comprised all the data mentioned above save the painted pottery. Thus, the surface collection at Takalghat and Khapa promised to throw light on the relationship of the Stone Circles at Khapa and the habitational deposits at Takalghat on one hand, and the cultural relationship between these two sites and those mentioned above on the other hand. This held out great possibilities of knowing more about the cultural substratum of the Vidarbha region at the time of the arrival of the megalithic tradition in this region.

In spite of the three phases of occupation at Takalghat, basically it was a single culture site. The overall picture which emerged indicated that the people lived in houses with mud walls impregnated with reeds. The floors of the houses were made by ramming compact brown clay, mixed with *kankar* and dressed with lime. Wooden posts supported the roof above. They used three main ceramic utilities. One was the painted black-on-red. Some of these pots seem to have been made by hand. The paintings, mostly on the external surface, were entirely geometrical: strokes, parallel lines, latticed diamonds, wavy lines, dots, sigma-like motifs, banner motifs, (Fig. 6) etc. Mostly the rims and shoulders were painted, and the shapes represented were globular pots, basins, and dishes. The other and the most quantitative in bulk was the micaceous red which had the clay mixed with profuse flakes of mica, which was ill-fired and which had matt red surface. This comprised mostly utilitarian shapes like globular storage pots, basins and pots with flaring funnel-shaped mouths. This had also a range of flat based pans and *kuṇḍās* with flaring high sides. No finer or small-size shape was executed in this ware. On the whole this was an unpainted ware save a couple of sherds which bore groups of lines in dull black mostly over the flared mouth of a globular pot. The painting was found to have been more an exception than the rule. The third ceramic was the black burnished or the black-and-red which was much less in quantity than the micaceous red but more than the painted black-on-red. The black-and-red exhibited mostly two shapes, the rimless bowl and a dish with either convex or double carinated sides. A few stands with hollow stems and somewhat hour-glass profile were also recovered. A large member of sherds in this ware had incised patterns in graffiti such as groups of lines, arrow-head-like motifs, ladder-like motif and compartmented rectangles.

These people also used beads of agate, crystal, carnelian, jasper and terracotta. Among carnelian beads some had etched patterns bearing a close resemblance with those known as "southern types". No specimen of agate etched in white was encountered. The beads of terracotta were entirely of arecanut shape, and the possibility of their being used as net-sinkers cannot be ruled out.

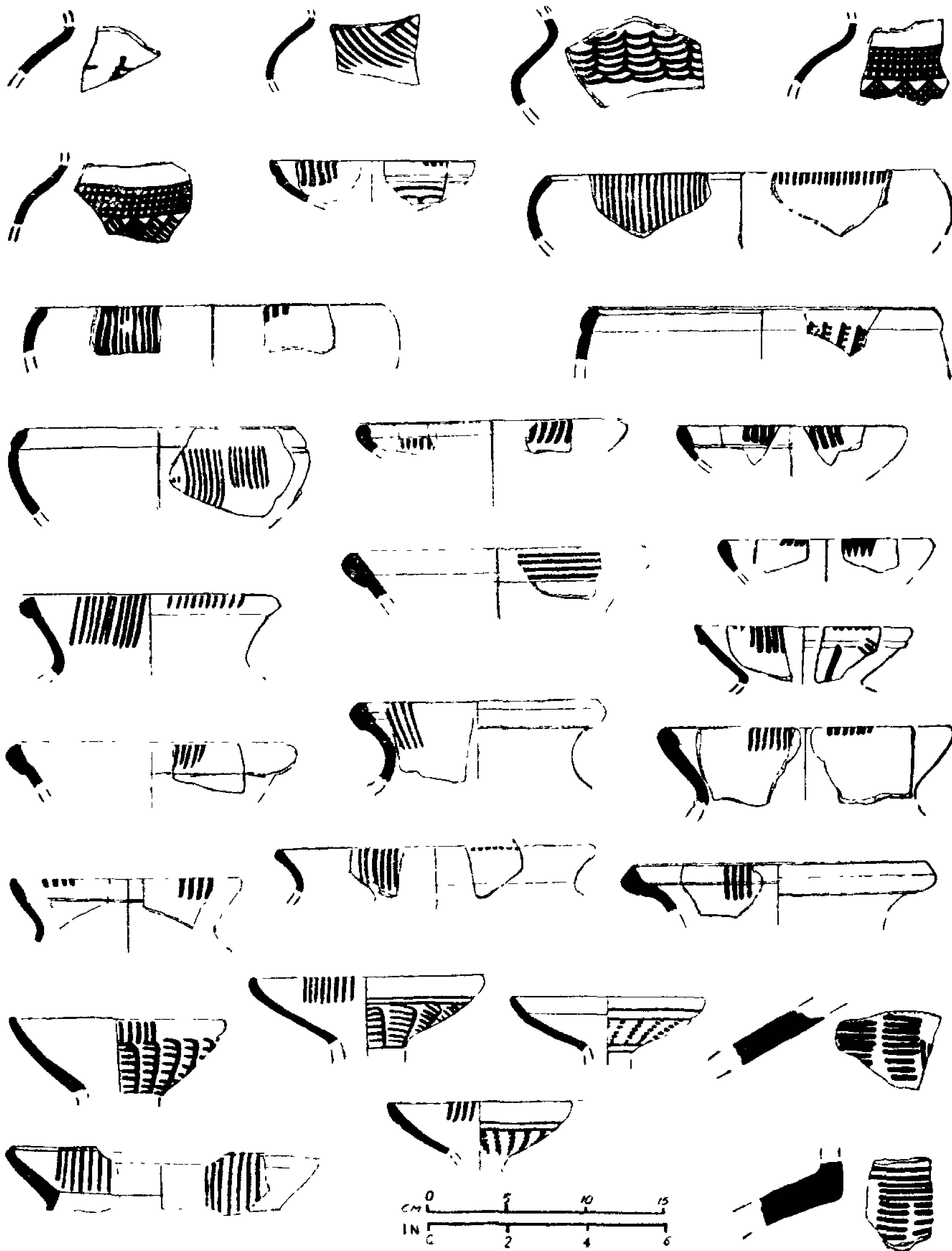


Fig. 6

In comparison with this, the cultural content of the Khapa megalith was equally interesting. These stone circles ranging normally between 12 and 14 metres in diameter, the largest being 23 metres, showed that the stones were arranged in a circle on the *murum* and then the cairn filling comprising blackish soil and pebbles was laid to a thickness of about a metre. In the

filling in which the black soil was capped by the pebbles, were also placed various iron and copper artefacts, beads and bangles, and pottery as also the skeletal remains of human beings and the horse.

The pottery was the same in fabric and typology with that encountered in the Takalghat habitations. However, there was one very significant exception. This pertained to the painted black-on-red ware which was not encountered in any of the Stone Circles. The black-and-red, the micaceous red, the coarse red and the drab grey as also the black burnished were found both at Khapa and Takalghat which bespoke of the cultural identity of both. It appears that painted pottery was a taboo in the Stone Circles. At Junapani also, except a single sherd of painted black-on-red ware, no other corroborating evidence on a larger scale was available. Thus the Junapani evidence, being exceptionally meagre, may not be taken into consideration.

The range of iron objects (Pl. IV) encountered in the Stone Circles comprised spearheads, dagger, barbed arrow-heads, swords, spikes, etc. The more interesting objects comprised double-edged adzes, nail-parer-cum-tooth picks and flat axes with ring band cross fasteners. Of these, the first are made of thin sheets of iron cut to a double-concave outline, very thin in the middle and with broad convex cutting edges. It is possible that these edges were used for cutting skins. The nail-parers were a rod of iron with one end tapering to a point and the other bevelled to a sharp broad cutting edge. Some of the pieces had cabled bodies. The flat rectangular axes with convex and broad cutting edge, flat top, sides slightly flaring towards the broad convex cutting edge and the body equipped with cross-band ring fasteners have been reported from several megalithic sites in the south as also at Takalghat itself. Along with these objects, a complete cauldron of iron with rivetted circular holds was also encountered in one of the Stone Circles.

The copper objects comprised fish-hooks, bangles of different sizes, bells with iron tongues, bells (for tying around the neck of a horse), dishes with lids and an ornament meant to be tied over the face of a horse. Of these, the first three were encountered even in the habitational deposits at Takalghat, whereas the dishes and their covers, bells and ornament for the horse were associated only with the Stone Circles.

The dishes of copper were normally with thin convex sides, flat base with a central boss on the interior and slightly thickened edge of rim. More distinctive were the covers made of copper. These had a circular base of the same diameter as that of the dishes, and tapering sides capped by a finial depicting motifs like four buds or birds perching on branches and facing each other (Pl. III B). The ornament for the face of a horse, which was found over the skeletal remains of a horse, was made of a thin sheet of copper cut to the shape of the face of a horse and bearing over it a series of tapering knobs rivetted at the back with iron pins (Pl. III A). The whole ornament looked like the

Brahmi letter '*ma*' and had crecentic projected ends which seems to have been further embellished by small tubes of copper with crescentic attachments. The copper bells encountered over the skeletal remains of a horse were hollow pieces with a ring hold at the top and a perforation at which possibly the iron tongue was rivetted. It may be stated that no other stone circle anywhere else in India has yielded objects of these two categories. The only parallels for the dishes with bird-lids can be had in the terracotta lids used by the tribal folks of the Nilgiris, as brought to our notice by Breeks.[4] It may also be recalled that Adichanallur[5] in the south has also yielded such lids with animal and bird finials. These suggest cultural links with the south.

The builders of the stone circles also used a variety of beads of semi-precious stones, typologically similar to those from the Takalghat habitations. Agate, carnelian, crystal, jasper and glass beads were found in the filling of the Stone Circles. Amongst these, the etched carnelian were the most noteworthy as their etched patterns were typically "southern" as reported from the megaliths from south India.

The skeletal contents of the Stone Circles were exceptionally fragmentary. However from the evidence of a few molars and pre-molars it could be possible to surmise that in one Stone Circle remains of more than one person were interred, that some of the teeth showed caries and dental decay; and finally the persons interred were definitely above the age of seventeen. The fragmentary bones also further suggested that the skeletal remains of both the male and the female were interred in one and the same circle. Some teeth showed stains possibly due to the use of tobacco, either masticatory or fumigatory.

The skeletal remains of the horse encountered in most of the Stone Circles suggested that the animal must have been of the age of not less than five years. It is interesting to note that whereas the Takalghat habitations gave evidence of the association of sheep, goat, pig, cattle and the horse, the Stone Circles at Khapa attested the presence of only the horse in burial. It is clear from the above evidence that animals of greater farm use were not burried in the Circles. The presence of the bones of the equidae family has also been evidenced in the Stone Circles at Junapani.

A broad summary of the evidence at Takalghat and Khapa thus proves the identity of cultural equipment between the habitations and the Stone Circles. This encompasses the equipment in respect of pottery, beads and iron and copper artefacts. The faunal identity is also remarkable.

On the basis of similarity of evidence, therefore, it may not be wrong to propose that in eastern Vidarbha lived a people who had been deeply influenced by the megalithic funerary tradition. When did these people flourish ? It was

not possible to answer this question categorically a few years back. However, C-14 dates from relevant sites have helped to make the matters more clear.

For instance Takalghat itself has supplied a C-14 date which helps to date the culturally akin Stone Circles at Khapa itself. The C-14 date for the bottom of Phase IB at Takalghat has come to 555 B.C. The one metre thick deposit of the earlier Phase IA would push back the beginning of the habitation at Takalghat by about a century or so or possibly even less. Thus this date could be placed to *c.* 7th century B.C. or thereabout.

This dating is in consonance with C-14 showings elsewhere. For instance, at Hallur the C-14 dates for possibly the Neolithic-Megalithic overlap comes to 955 B.C. Could it be, therefore, that the megalithic traditions took about a couple of centuries to penetrate Vidarbha? This can be proved, disproved or adjusted if C-14 dates for the megaliths in the regions to the east and south of Vidarbha as also the dates from Ranjala or Tekwada in Khandesh are available.

Inspite of these, there is one factor which has to be given due importance. This pertains to the painted black-on-red pottery. Certain points have to be emphasised. This pottery has been found at Kaundinyapura I, Paunar I and Takalghat. Though, it is associated with megalithic habitations as at the first and the third sites, it seems to have been absent in the Stone Circles. In fabric and typology it is certainly different from the Chalcolithic pottery current in western Maharashtra. Moreover, no such fabric has been reported so far from the Andhra-Karnatak region from which the megalithic traditions seem to have penetrated Vidarbha. As such, the painted ware seems to have been characteristic of the Vidarbha region.

Since some of the items of material equipment at Takalghat and Khapa as also those reported from Kaundinyapura, Paunar and Junapani have parallels from the South Indian or Andhra megaliths, its cultural impact is apparent. Even now Vidarbha has open borders with Andhra, and the cultural influence is even now apparent in the border districts of Bhandara, Nagpur and Chanda.

The Vidarbha megaliths, therefore, present a picture of cultural amalgamation between the indigenous painted pottery culture and the southern and eastern megalithic traits.

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GENESIS OF THE JORWE CULTURE

BY

M. K. DHAVALIKAR

THE VARIOUS Chalolithic cultures of Central India and the Deccan are now more or less defined on account of their characteristic pottery and, to some extent, their cultural equipment. Of these, the Jorwe culture is now fairly well known and a number of sites of this culture have so far been excavated. In this connection, special mention should be made of Nevasa (District Ahmadnagar, Maharashtra) on the banks of Pravara, a major tributary of the Godavari, which has been excavated on a considerably large scale. The excavated remains give us a fairly good idea of the distribution of the Jorwe culture in time and space and also about its relationship with the contemporary cultures of the Southern, Western and Central India. However, the whole mass of evidence so far recovered from excavations and surface explorations appears to be insufficient for the simple reason that it does not throw light on its origins nor does it enlighten us about the end of this culture. So far as the sudden extinction of the Jorwe culture is concerned, the evidence from most of the sites shows that the whole chalcolithic activity came, as it were, to a grinding half but there is no evidence to show the cause of it. Above all, we do not even know the various stages of development of the Jorwe culture : its birth, its adolescence, its efflorescence and its decline are all as yet unknown to us. However, the available evidence, if subjected to close examination, can be said to throw some light on the antecedents of this culture. In the following pages, therefore, an attempt has been made to show that the culture was evolved out of the co-mingling of earlier cultures and developed its own diagnostic traits in course of time while assimilating, at the same time, influences from contemporary cultures in adjacent areas.

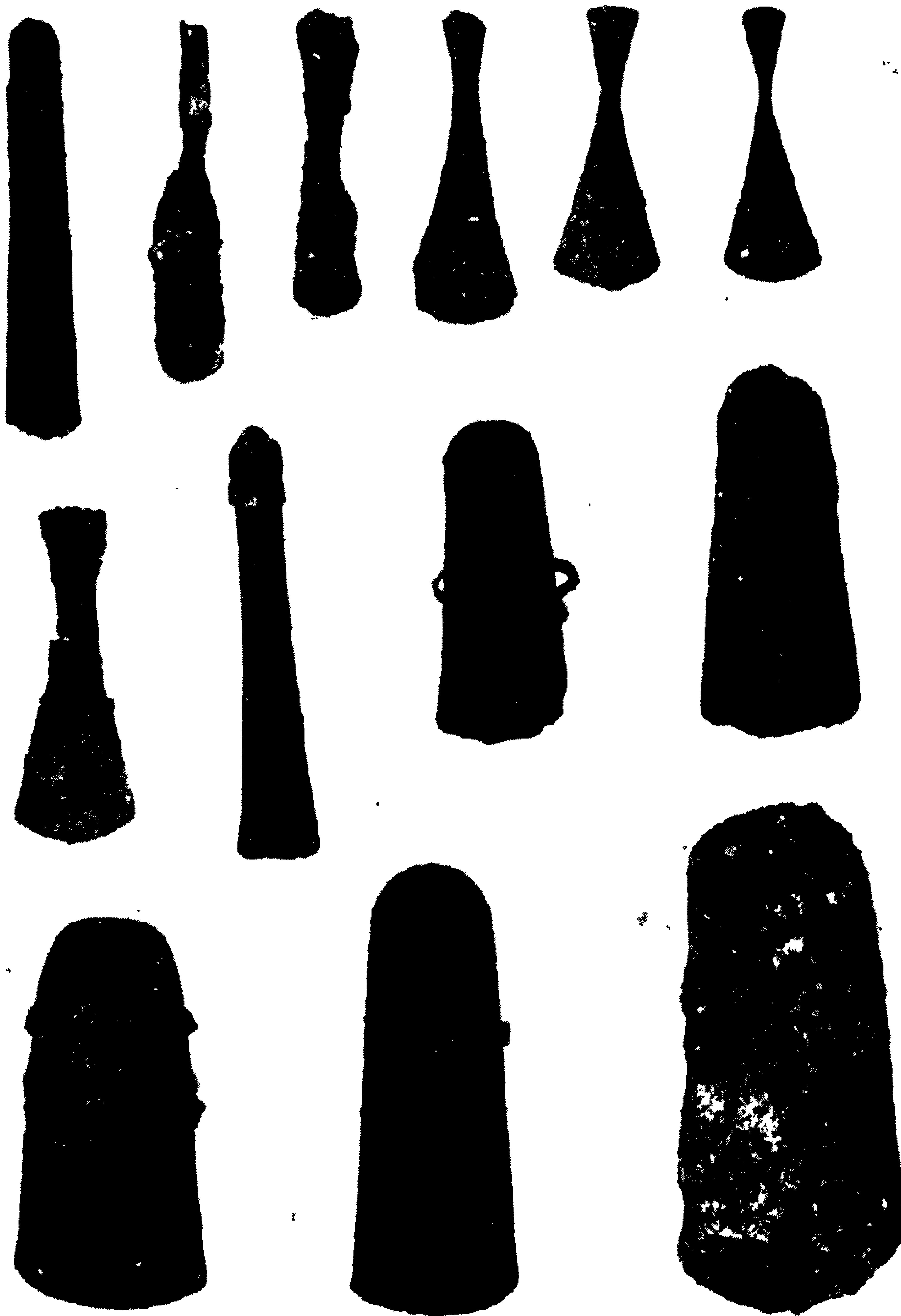
Before embarking on the analysis of the excavated evidence, it is necessary to outline the salient features of the Jorwe culture and its diagnostic traits which have lent it a unique character. As is well known, the culture derives its name from the site where it was first identified, that is, Jorwe (Taluka Sangamner, District Ahmadnagar) which is situated on the Pravara, a tributary of the Godavari. But the stratigraphical position and the chronological horizon of the culture was placed on a firm footing on the basis of evidence from the excavations at Nasik. During the last twenty years or so, a number of settlements of this



Pl IIIa · Copper ornaments for the face of a horse



Pl IIIb : Copper dish and cover



Pl. IV : Iron objects from Stone Circles

culture have been brought to light and the prominent among these, which have been subjected to scientific excavation, are Nevasa and Daimabad (District Ahmadnagar), Bahal (District Jalgaon), Prakash (District Dhulia), Chandoli, Sonegaon and now Inamgaon (District Poona). The explorations carried out so far point to the Pravara-Godavari basin as the nuclear area of this culture and its peripheral zone extends towards the Krishna valley in the south and the Tapti in the north. It can, therefore, be said that the culture was spread over the present Maharashtra except in the coastal region of the west or the Konkan.[1] For chronology, we have a few radio-active carbon determinations which, along with stratigraphical evidence, show that the culture flourished in the latter half of the second millennium B.C., that is, from *Circa* 1500–1000 B.C.. For all this long span of five hundred years, there do not appear to be any ups and downs and the cultural pattern remains fairly uniform from its birth to death. The earliest C-14 date so far obtained is from Sonegaon which is 1565± 110 B.C.[2] It is helpful in placing the beginning of the Jorwe culture at about 1600 B.C.

The cultural equipment of these early farmers of Maharashtra was chalcolithic in character; they mostly used stone tools such as polished stone axes and a specialized blade-flake industry, but at the same time they also used copper or low grade bronze, albeit on a restricted scale. They made plain and painted pottery which is distinctive on account of its form and fabric and ornamentation as well. The painted pottery is fine in fabric and well baked, possibly at a high temperature. It has a red or bright orange matt surface on which was executed painted ornamentation in black pigment. The most characteristic shapes comprise a concave-sided bowl with sharp carination and a *loṭā*-shaped vessel with wide flaring mouth and having a tubular spout. Also common was a water jar with high neck and globular profile. These are the typical shapes, almost fossil types. Along with this fine painted ceramic, there existed coarser fabrics. They are found in large quantities which bespeak of their utilitarian character. They comprise drab grey and red wares, mostly handmade and ill-fired as the blotchy surfaces of vessels suggest. They are represented by such utilitarian forms as the dough-plate and the platter, storage jars of varying sizes, cooking vessels like wide mouthed globular pots, jars with flaring mouth and an assortment of lids with knobs and handles. The grey ware is sometimes treated with red ochre on rim while the coarse handmade forms are decorated with incised and applique patterns. Lamps, oval in shape and with a central groove for wick, are also in grey or red ware.

The twin-urn burial is also a distinguishing feature of the Jorwe culture. Two grey ware urns with globular body and flaring mouth were placed horizontally, mouth-to-mouth, in a pit just enough for the purpose. Sometimes, more than two urns were used and burials with three and five such urns have been reported from Daimabad and Nevasa respectively. Usually the urns contained the skeletal remains of children. A spouted vessel and a carinated bowl of the Jorwe fabric were kept in the burial as grave goods. For adults, there

were extended burials in which we come across complete skeletons. The burials have been always found within the habitation area save at Bahal where the cemetery was situated on the opposite bank of the river at Tekwada.[3]

The foregoing analysis of the cultural equipment, more particularly of the ceramic industries, shows that the Jorwe culture is characterised by two distinct pottery fabrics viz., the painted black-on-red ware and the coarse red/grey ware. The former can at once be recognised as the distinguishing feature of the Jorwe culture, whereas the latter, the grey ware, which is associated with it, also happens to characterise the southern neolithic cultures. There should be little doubt that the grey ware of the Jorwe culture was a contribution of the pioneering colonizers of the Southern Deccan. Similarly the painted black-on-red pottery is akin to its counterpart from Central India. It is difficult to assess the precise contribution of the Malwa culture in the making of the Jorwe culture, but the similarity is too tempting and cannot be without significance. Chronologically also, it is now firmly established that the southern neolithic on the one hand and the Central chalcolithic on the other are anterior to the Jorwe culture, both having originated in the earlier half of the second millenium B.C. The evidence from the excavated sites in Maharashtra also demonstrates the same. It would therefore be profitable to examine the excavated evidence.

Of all the chalcolithic sites in Maharashtra, Jorwe[4] was the first to be excavated. However, being a single culture site, it offered no clue to establish the relationship of the Jorwe culture with the earlier prehistoric cultures on the one hand and early historic cultures on the other. At Nasik[5] the culture sequence begins with the Jorwe culture and the excavation was therefore only helpful in establishing that the Jorwe culture preceded the early historic cultures. The excavation at Bahal[6] further showed that the earliest settlers of the site used predominantly a grey ware, a ceramic which characterises the southern neolithic. The painted black-on-red Jorwe fabric, however, was also used, though on a small scale. Thus the precedence of the coarse grey ware was established at Bahal.

That the Malwa culture of the Central Indian chalcolithic is earlier than the Jorwe culture has already been established by the excavations at Navda Toli where the black-on-red Jorwe fabric occurs in the third cultural phase of the chalcolithic occupation.[7] However, the Jorwe pottery in Central India only points to the cultural contact between the two chalcolithic people. Within the area of the Jorwe culture, we find that the first settlers were of the Malwa culture. At Prakash on the Tapti, the earliest occupants used predominently Malwa painted pottery and it is only later in period IB that we come across the remains of the Jorwe culture.[8] However, Prakash cannot be regarded as the northern outpost of the Jorwe culture, for even a cursory glance at the statistical analysis of the pottery industries of Prakash shows that the whole chalcolithic occupation is of the Malwa complex and even in Phase IB it is the Malwa fabric which is

predominant whereas the quantity of the Jorwe fabric is negligible.[9] Prakash, therefore, can be taken as a southern outpost of the Malwa culture.

Another important piece of evidence comes from Bahal where the earliest culture is characterised by the predominance of the coarse grey ware of the southern neolithic and the typical Jorwe culture becomes predominant in the later phase IB.[10] The evidence is significant inasmuch as it points to the precedence of the grey ware using people. This, together with evidence from Prakash, helps us in establishing the relative chronological horizon of the Jorwe culture *vis-a-vis* the Malwa culture and the grey ware of the southern neolithic. The Jorwe culture was later in point of time as compared to the other two. But in order to understand the relative stratigraphical position of all the three cultures we have to take recourse to yet another site which furnishes us valuable evidence. It is the excavation of Daimabad on the Pravara, which can offer solution to the problem.

Daimabad, a deserted village today, is situated on the left bank of Pravara, a tributary of the Godavari and is not far from another important chalcolithic settlement at Nevasa which is only about 25 km. as the crow flies, on the same river downstream. It represnts an extensive chalcolithic settlement and was never occupied again after the chalcolithic people deserted it. The site was excavated by M. N. Deshpande of the Archaeological Survey of India in 1959 and the excavations, though restricted in time and resources, have proved to be of great importance.[11] The excavation brought to light a three-fold sequence of cultures. The earliest inhabitants were a neolithic folk using the coarse grey and handmade wares. Their tool outfit comprised ground and polished stone tools and a specialized blade-flake industry. They do not seem to have known copper or bronze. They appear to be closely related with the southern neolithic people. The second period witnessed the arrival of a new set of people who probably came from Central India. They used the painted black-on-red pottery of the Malwa fabric. However, the earlier grey and handmade ceramics also continued to be used side by side. These people also introduced copper or bronze and their artistic inclination is evidenced by the terracotta figurines of bulls. The Jorwe culture flourished at the site in the third period and there is an appreciable overlap between the second and the third periods.

The evidence from Daimabad is extremely important since it has established the relative stratigraphical position of the three cultures. It also demonstrates that the earliest settlers of the Pravara-Godavari basin where the neolithic farmers who can be taken to have come from the Southern Deccan as their cultural assemblage shows. They were thus the pioneering colonizers of Maharashtra who introduced the food-producing economy with all its concomitants. On the basis of the evidence from Bahal it appears that they had reached the Tapti valley also. At Daimabad they possibly lived in humble dwellings of mud and used handmade pottery. What grains they cultivated we do not know

for certain for want of evidence. Animal bones were found in large quantities at Daimabad, and we will know the domesticated species only after the bones are studied. For the present, however, we can definitely say that the Daimabad excavations have clearly established a neolithic substratum in the prehistory of Maharashtra.

The second period at Daimabad is characterised by the Malwa culture with its painted black-on-red pottery. These people undoubtedly came from Malwa in the north, and in their march towards south they had established an important settlement on the Tapti at Prakash. At Daimabad they do not appear to have destroyed the neolihic occupants of the site but rather lived amicably with them and later dominated over them in course of time as is borne out by an appreciable overlap in the stratigraphical sequence. They also appear to have assimilated some of the cultural traits of their precedessors for they also used the coarse grey and the red wares, so characteristic of the southern neolithic. It is probably these people who introduced the potter's wheel and the copper technology.

The stratigraphical evidence at Daimabad clearly shows an overlap between the Malwa culture and the succeeding Jorwe culture. The question that then immediately arises in the mind is whether the Jorwe culture was born out of the synthesis of the Malwa and the southern neolithic. This synthesis is evident in the middle phase at Daimabad. In fact, on closer observation this appears to be the only probability. The Jorwe culture folk, as already stated, used tht painted black-on-red pottery and coarse grey and handmade fabrics. Of these, the latter are unmistakabbl adaptations from the southern neolithic. But nothing can be said about the origin of the painted black-on-red ware. However, it has some characteristics in common with the painted ceramic of the Malwa fabric. It would rather be too superficial to observe that the tradition of painting in black over red surface is shared by both. On deeper study it becomes apparent that there are many elements which are common to both.

The most characteristic forms in the Jorwe ware are the concave sided carinated bowl and the spouted *loṭā* shaped vessel. The latter has no counterpart not only in the Malwa ware but also in the whole range of prehistoric painted pottery of India. The thin walled carinated bowl, however, can be said with certainty to have derived from the bowl in the Malwa ware which is rather deep has blunt carination.[12] Similarly *loṭā*, with a squat bulging body and high neck has a corresponding form in the Malwa ware.[13] The globular jar with short or high neck is also paralleled in the Malwa chalcolithic.[14]

The spouted vessels, so characteristic of the Jorwe **ware,** are conspiciously absent in the Malwa ware which, however, is distinguished by the channel spout.[15] But the channel spout is not to be seen in the Jorwe fabric.[16] It is not unlikely that the tubular spout was a further development of the channel spout, but the strong predilection of one form of spout to the total exclusion

of the other in both wares is rather enigmatic, for it is reasonable to expect the occurrence of both at some stage of development in the Jorwe fabroc which is later in point of time. This leads us to seek the prototypes of the tubular spout elsewhere. Spouted vessels are rare in early Indian pottery and it is not therefore improbable that its presence in the Jorwe was rather due to influence from Western Asia where an immense range of spouted vessels existed in the Bronze Age. But the spouted vessels from Western Asiatic sites are morphologically so removed from the Jorwe jars that it would be absurd to infer any foreign influence at least so far as this type is concerned.

The spouted vessel of the Jorwe fabric is characterised by its sharp profile. This may lead us to guess that it was rather modelled after a metal prototype of copper or bronze. But no metal prototype has so far been found and it cannot be said to be the imitation of metalware. In this connection it is interesting to note that the spouted vessels were not uncommon in the pottery forms of the southern neolithic. In fact in the secondary neolithic of Brahmagiri, to quote (Sir) Mortimer WHEELER, "spouts are a familiar feature throughout the IB phase of the Brahmagiri Stone Axe culture".[17] In the coarse grey fabric of the southern neolithic we come across not only vessels with pinched lip and channel spout but also jars and bowls with tubular or funnel spouts. It is very tempting to compare T 46 of the Brahmagiri Stone Axe Culture, which is a *loṭā* shaped vessel with round bottom, outcurved rim and a slightly curved tubular spout, with that from the Jorwe ware.[18] But the nearest parallel, in form and function, is from Tekkalkota, a neolithic site in the Southern Deccan in the Krishna valley. It is reported from the earliest levels — Phase IA — representing the early neolithic strata assigned to the middle of 18th century B.C. on the basis of the radio-active carbon determinations.[19] It, therefore, seems most likely that the spouted vessel of the Jorwe ware was an imitation of its neolithic prototype.

Some pottery of the Jorwe fabric has been reported from Navda Toli where it occurs in the third cultural phase of its chalcolithic occupation,[20] and has been dated, on the basis of C-14 determinations, to 1600 ± 130 B.C.[21] A casual glance at all the C-14 dates so far obtained for the Jorwe culture will show that this is by far the earliest date. It may then lead us to postulate the origin of the Jorwe culture in the Narmada valley. But it should be remembered that an equally early date has been obtained for a sample from Sonegaon which is assigned to 1565 ± 110 B.C.[22] Besides the excavations at Prakash, Daimabad, and now at Inamgaon, show that the Malwa culture was already spread over the northern and central parts of Maharashtra. It, therefore, seems likely that the Jorwe culture was born in the Pravara-Godavari valleys, sometime about the second quarter of the second millenium B.C.

The Godavari-Pravara valleys appear to have been endowed with a most favourable environment which attracted these pioneering colonizers of Maha-

rashtra. The sites of Daimabad and Nevasa on the Pravara are located in a vast stretch of alluvium which is about three metres in thickness. This unusual accumulation of alluvium abuts against the steep scarp of the Ahmadnagar plateau. This scarp of the southern divide of the Pravara-Godavari does not appear to be erosional but seems to have its origins in tectonic movements.[23] The rich alluvial stretch was probably characterised by thin vegetation and was well watered by the Godavari and its tributaries. Thus the Jorwe culture people were attracted by this most congenial envionment and the available evidence, analysed above, also shows that this was the cradle of the Jorwe culture.

The Malwa ware probably represents a cohesive group of people who, after establishing themselves in the Narmada valley, began to spread out from their habitat in Central India. They had no opening in the north which was already occupied by semi-urban communities and they therefore began to move towards south in the Northern Deccan which was sparsely occupied by neolithic food producing communities. Thus they already appear by the end of the first phase at Daimabad. Here they seem to have appreciated the functional aspect of the funnel spout, for we have a typical Malwa ware bowl from Daimabad with a tubular spout.[24] Similarly Malwa ware vessels with tubular spout have also been found in the recent excavations at Inamgaon.

The correspondence between the two ceramics, that is the Jorwe ware and the Malwa ware, is also noteworthy. The animal motifs so common in the Malwa ware are rarely to be met with in the Jorwe, but there are several geometrical patterns which are common to both. The triangles and diamonds, either vacant or hatched or solid, are to be met with in both the industries. So also are the liner patterns. Notwithstanding the fact that these are basic design elements which could have been evolved independently, the correspondence is not without significance. Furthermore, the painted ornamentation is panelled in both the wares. Among the specialized motifs mention should be made of what can be called the rayed volutes and the double-axe motif. All these appear to have been assimilated by the Jorwe potters from their counterparts in the Central India. Thus the conribution of the Malwa culture in the making of the Jorwe culture is quite substantial.

As already stated, the tradition of painted black-on-red ware is also derived from the Malwa culture. But the Jorwe potter appears to have borrowed the technique not blindly for he also prefected it. The Malwa ware is rather thick. in section and has a coarse and gritty fabric whereas the Jorwe ware has throughout a fine fabric. It is turned on a fast wheel and has therefore uniformly thin walls showing regular striations. It is hard fired and always shows fully, oxidized core sections. It does not have the thick slip as in the Malwa ware, but has a wash of red in all its different shades. The designs are executed with a fine brush with geometrical precision and sometimes the use of multiple brushes

is also attested. The painted ornament, though rendered in free-hand style, seems to be better drawn than that on the Malwa ware.

Another important characteristic which the Jorwe people borrowed from the neolithic farmers of the south is the custom of burying the dead in urns. The twin urn or the multiple urn burial is the most distinguishing feature of the Jorwe culture. However, we only find the skeletal remains of children in these urn burials and adults were laid in oblong pits. The Jorwe people used invariably the large grey ware urns having globular body and wide flaring mouth for the burial urns. Their preference for the grey ware urns is itself a sufficient indication of its being a southern tradition. So also is the practice of keeping the spouted vessel in the burial. The southerners placed a spouted grey were vessel in the urn burial while the sophisticated Jorwe folk used the painted one instead. As Wheeler observes, it was probably used for pouring libations[25] and the same probably holds good for the Jorwe burials. This custom of twin or the multiple urn burials appears to have been confined to the Krishna and the Godavari valleys. It does not appear to have reached further north even in the lower Tapti valley for even at Bahal it was not in vogue. Prakash on the Tapti was, as already observed, beyond the pale of the Jorwe culture and it is therefore not reasonable to expect the occurrence of these burials there.

The chalcolithic cultures of Central India and the Deccan bear some resemblance with the Chust culture of the Farghana valley of Central Asia (now a part of the U.S.S.R.). This has led ZADNEPROVSKY to postulate close contacts between the two cultures. But SCHATENKO, on the other hand, considers that the Indian chalcolithic cultures are purely indigenous. The similarity between the two cultures is only superficial and need not be stretched too far. This will become apparent if we take into consideration the fact that the Chust culture of the Farghana valley is quite late in point of time for it is dated to about the beginning of the first millenium B.C. Another important factor that should also be considered is that the Chust culture is characterised by burials wherein skeletons are placed in a crouched position. This is in sharp contrast to the chalcolithic burials of the Deccan wherein not a single skeleton has so far been found in a crouched posture. The basic differences therefore are sufficient to show that the Central Asian culture bears no relationship whatsoever with those of Central India and the Deccan.

The foregoing analysis of the evidence from several sites of Jorwe culture shows that the culture was born in the Godavari-Pravara basin sometime about the second quarter of the second millenium B.C. and we witness its efflorescence after about the middle of the millenium. To a considerable extent it can be said to be the result of the synthesis of the Malwa culture of the north and the neolithic culture of the Southern Deccan. It flourished for about five centuries,

but for all this considerable period of time we as yet do not know all the different stages of its development. Its sudden disappearance is equally enigmatic. Most of the sites of the Jorwe culture which were later occupied by the iron age people show that they were deserted by the earliest chalcolithic inhabitants by about the beginning of the first millenium B.C. or even later. That they were left unoccupied for a considerable period of time is indicated by the formation of a thick black soil layer, usually sterile, between the strata of two cultures. Only at Prakash there is an intervening layer of fine gravel which is sure enough an indication of the desertion of the site because of heavy floods in the Tapti. In the south the neolithic-chalcolithic is overlapped by that of the megalith builders. But there is no such ecidence so far at least from the Jorwe culture sites.

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THE PANDHARPUR STONE INSCRIPTION OF THE YADAVA KING MAHADEVA, SAKA 1192

Shobhana GOKHALE

PANDHARPUR IS famous as a centre of pilgrimage of the 'Vārakari sect' in Maharashtra. It is situated on the right bank of the river Bhīmā, approximately 130 miles to the south-east of Poona.

The basalt stone pillar, bearing the inscription is built up horizontally in the walls of the police-station at Pandharpur, not far from Vitthal temple. It is not a newly discovered inscription. Scholars like R. G. BHANDARKAR,[1] H. COUSENS,[2] G. H. KHARE,[3] S. G. TULPULE[4] in their researches have taken note of this record. While mentioning the chronological evidence of the names 'Viṭṭhala' and 'Paṇḍuraṅga', DELEURY[5] has also referred to this inscription. However, this important inscription has remained unpublished as the incision of the letters on some parts is rubbed off. It contains numerous scribal errors and hence the reading as well as the interpretation is extremely difficult. I venture to publish my reading with a view to opening its contents to the scholars of epigraphy. In this effort I have been helped by G. H. KHARE. M. S. MATE brought this inscription to my notice. To both of them my thanks are due.

The actual writing covers an area about 66¼ cm. length and 36¼ cm. in breadth. The average height of a letter is 1¼ cm.. The inscription has altogether 47 lines and 19 stanzas. The writing is neatly done but as the letters are not deeply engraved, on some parts, they are worn out. Both the sides of the stone are partly broken. Moreover, as the pillar is not in a satisfactory state of preservation, more and more damage is bound to occur day by day.

Characters

The characters are Nāgari of the 13th century A.D. with the use of Pṛsthamātrā. Of the initial vowels *'a'* occurs in lines 2, 18, 19, *'a'* in the line 8, *'u'* in the line 7. As regards orthography mention may be made of the final *'m'* to anusvāra in lines 7, 25, 33. The vowel *'ṛ'* is indicated by *'ri'* in the words *'sambhṛita'* and *'śringāra'* in lines 9 and 10 respectively. The use of *Jihvāmūlīya* occurs in the words—*'Kānchanaiṣkānchanairapi' Kaṅkaṇaḥ-kaṅ-*

kaṇairapi, *'Keshavaḥ kathyate kiṁ'* in the verses 7, 8, 10 respectively. *'sa'* is written for *'śa'* in line 12. The numerical symbols for 1, 2, 9 are used in lines 1 and 2.

Language :

The language of the record is Sanskrit and the record with the exception of the first two lines has been composed in a beautiful *kāvya* style. The composition is faulty in some places and the engraver has also committed several mistakes. Due to the discrepancies thus creaed by the scribe and the damage done to the record no connecting link can be established between one verse and the other.

The details of the date of the record given in lines 1, 2 as *śaka* 1192, *Pramoda, Jyeṣtha śu* 11, Sunday are regular and correspond to A.D. 15 June 1270.

Object :

The object of the inscription is to record the celebration of the Aptoryāma sacrifice performed by Keśavaputra Bhānu. R. G. BHANDARKAR[6] read the word Bhānu. Though at present only the first letter 'Bhā' is visible, the second letter must be the short letter 'nu' as it satisfies the requirements of the metre *śārdūlavikrīḍita*. The inscription belongs to the time of the king Mahādeva of the Yādava dynasty of Devagiri and his feudatory Bhānu.

The inscription is interesting from various points. Firstly it is the only known record of the Yādava king Mahādeva which mentions the feudatory ruler Bhānu. Secondly, at present, this inscription may be regarded as the last dated inscription of Mahādeva. From the date of this inscription *Jyeṣṭha śu* 11 Śaka 1192 (A.D. 15 June 1270) and the date *Māgha śu* 12 *ś* 1193 of the Paithan[7] plates (A.D. 13 Jan. 1272) of Rāmachandra, it seems that Āmaṇa the son of Mahādeva ruled not more than eight months. The incident of snatching of the kingdom from Āmaṇa by Rāmachandra, the son of Kṛṣṇa is well corroborated by the Paithan and Purusottamapuri[8] plates but from the date of the present inscription it seems that the incident took place in between the two above-mentioned dates. Thirdly the name of Mahādeva is coupled with the sovereign title of the Yādavas 'Proudhapratāpa C'akravarti'. The assumption of this title by Mahādeva gives a concrete evidence regarding the existence of Yādava dominion, in Pandharpur region. The inscription records the earliest inscriptional evidence of the name *'Pāṇḍuraṅgapura'* and thereby establishes for the first time the identity of *'Pāṇḍuraṅga'* and *'Viṭṭhala'*.

The record opens with the *'Siddham'* symbol followed by the date and the name of the Yādava sovereign Mahādeva with his paramount title *'Prouḍhaprātapacakravarti'*. Verses 1-2 are, devoted to the praise of God Brahmā.

Verse 4 mentions the name Kaśyapa, the father of all living beings. Verse 5 records the name Śārṅga, the ancestor of Bhānu. Verses 5-6 refer to the family name 'Sitavāḍaka' and the name Keśava who was the father of Bhānu with specific mention of his feudatory status. Verses 6--12 are devoted to the eulogistic description of the heroic deeds of Keśava but they do not refer to any historical event. Verses 13-14 record the name Bhānu, the son of Keśava endowed with the same status and chivalry like that of his father. Line 38 mentions the name of the sacrifice as 'Aptoryāma'. Verses 15-17 are devoted to the magnificent description of the sacrifice. Line 39 refers to the name of the priest 'Śrīśarmayajña' who officiated at the sacrifice. Verse 19 introduces the river 'Bhīmarathī', the splendid city of Pāṇḍuraṅgapura and God Viṭṭhala. The inscription ends with the word *'mangalam'*.

The following inscriptional evidence which provides important incidents during the reign of Māhadeva are worthy to be taken note of.

The Mamdapur inscription[9] of Kṛṣṇa dated Ś. 1172 (A.D. 1250) describes Mahādeva as the heir apparent. The Kalegaon[10] plates mention the date of the coronation of Mahādeva as Ś. 1182 (A.D. 1260). The inscription from Channagiri taluq dated[11] Ś 1190 (A.D. 1268) records the victory of Mahādeva over the Malava, Gurjjara and the Telaṅga Kings and this description is well corroborated by the account given by Hemādri.[12]

The present inscription has raised the following important points for consideration :

i Antiquity of the name 'Viṭṭhala' in inscriptions.

ii Association of Viṭṭhala with 'Pāṇḍuraṅgapura'.

iii Mention of the feudatory king Bhānu.

iv Celebration of the 'Aptoryāma' sacrifice.

v Observance of 'Ekādaśī' *vrata.*

A chronological history of the name Viṭṭhala has been given by both. KHARE[13] and DELEURY.[14] The earliest word which has a probable connection with the name 'Viṭṭhala' is the name of a brahmin, Jayadviṭṭha; which occurs in the Pandarangapalli inscription of the 1st quarter of the 6th century A.D. On the basis of the correct separation of the name as 'Jayad-viṭṭha', DELEURY has pointed out that the name 'Jayadviṭṭha' has no connection whatsoever with the word 'Viṭṭhala'. However, the reading of the name 'Jayadviṭṭha'[15] given by KRISHNA is not accepted by MIRASHI. Recently[16] he has shown that the name 'Jayadviṭṭha' occurs nowhere in the grant. The 14th line in the photograph of the grant where the name 'Jayadviṭṭha' is read, is too indistinct to give any far-fetched and imaginary reading and hence the probable reading of the name 'Jayadviṭṭha' does not help in tracing the antiquity of the word 'Viṭṭhala'.

The grant mentions the donated village Pāṇḍaraṅgapalli which is very important in tracing the early history of the city of Pandharpur. But objections have been raised by MIRASHI in identifying Pāṇḍaraṅgapalli with Pandharpur. He gives possible location of it, in the vicinity of Javali[17] near Mahabalesvar in Maharashtra.

DELEURY has pointed out that the donated village 'Bhāṇḍāragaviṭṭage' in the inscription of the king Kirtivarman[18] VI gives the first clear inscriptional connection between Pandharpur and Viṭṭhala under its prototype, but according to FLEET the donated village 'Bhāṇḍārgaviṭṭage' must be Bhandarkowathe in the Sholapur district and hence the word 'Bhāṇḍāragaviṭṭage' does not show any association with 'Viṭṭhala' of Pandharpur.

The Radhanpur inscription[19] dated Ś 730 A.D. 808) records two names of brahmins, Viṭṭhuduveja and Viṭṭhapu. DELEURY[20] has pointed out that all A.D. 1218 the name 'Viṭṭhala' does not occur in inscriptions. However, he has mentioned various prototypes of the name 'Biṭṭi', as they occurred in inscriptions between A.D. 808 to A.D. 1218. Two[21] inscriptions from Shimoga district dated Ś 1135 and Ś 1140 respectively, record the name of God 'Viṭṭhala'. The inscription dated Māgha Ś 15 lunar eclipse which belonged to Vira Ballāḷa of the Hoysaḷa dynasty records land-grant for Viṭṭhala but the lunar eclipse did not occur in the month of Māgha in Ś 1135 and hence the evidence cannot be taken as genuine. The second inscription which belonged to Siṅghagaṇadeva[22] records that the minister Māyideva was the worshipper of God 'Viṭṭhala'. But both these evidences of 'Viṭṭhala' do not establish any relation with 'Viṭṭhala' at Pandharpur.

A Marathi inscription[23] which is said to be dated Ś 1110 according to TULPULE records that there was a group of devotees of Viṭṭhala and the Yādava king Bhillama granted some financial assistance to build a small structure to house their God. The inscription mentions the name 'Viṭṭhala'. TULPULE read the date as Ś 1110 with its cyclic year name 'Saumya'. But the second and the third numerical figures are not clearly visible even in the original estampage, kindly made available to the writer by TULPULE. Due to this obscurity of the numerical figures and also on palaeographical grounds KHARE[24] disagrees with the reading of the date of the inscription. Nowhere are the Pṛṣṭhamātras used in the inscription. Even if the non-use of the Pṛṣṭhamātrā is not the only criterion in determining the early antiquity of the inscription, still the letters do not look so old. MIRASHI[25] has pointed out that in the Śaka year 1110, the name of the cyclic year was 'Kīlaka'. He has shown that the usual practice is to mention the numerical figures of the lapsed year, along with the name of the current cyclic year and therefore the reading of the date as Ś 1110 and the name 'Saumya' cannot go together. The name of the cyclic year Ś 1111 was 'Saumya', and therefore the reading of the year as 'Saumya' does not solve the problem, unless it is taken to be a scribal

mistake. Because of the doubtful reading of the date, it cannot be taken as the earliest epigraphical evidence of the name 'Viṭṭhala'.

A clear mention of ' Viṭṭhala ' with its close association with Pandharpur in the name ' Paṇḍaraṅge ' occurs in a stone inscription which is not yet published. The inscription which is in Devanāgarī characters and is partly in Sanskrit and partly in Kannada on an over-head beam in the present Viṭṭhal temple at Pandharpur dated Ś 1159, records that the Hoysaḷa king Someśvara donated a village named Hiriyagarañja for meeting the expenses of different ' bhogas ' of ' Viṭṭhala '. The word bhoga ' definitely indicates the Vaiṣṇava character of god ' Viṭṭhala '. The inscription mentions Pandharpur as ' Paṇḍarage ', a big village on the bank of the river Bhīmarathī. So far no such clear reference showing a close association of Viṭṭhala and Pandharpur was available. It may be suggested that the Sanskritized word ' Paṇḍuraṅga ' can be derived from the word ' Paṇḍarage ' which has a Kanarese suffix ' ge ' denoting possession. In Kanarese the word 'Paṇḍara[26] stands for a pandal for training vines. It is interesting to note that in śloka 14, the inscription records grape creepers on the sacrificial pandal. It therefore throws some important light on the flora of the period. Today the region is well-gnown for grapes. KHARE has already shows that like Nesarika > Nesaria > Nesari the estymology of the word ' Pandhari ' may be as Paṇḍarkā > Paṇḍariā > Paṇḍhari.[27]

Inscriptional evidence may be supplemented by literary evidence and the cognizance of them has already been taken by KHARE.[28] The *Padma Purāṇa*[29] refers to ' Viṭṭhala ' on the river Bhīmarathī in the section of " Gitāmahātmya ". But as there is every possibility of its interpolation in Puraṇic works, it cannot be taken as an authentic evidence to draw any definite conclusion regarding the early antiquity of the word 'Viṭṭhala'. Bilvamaṅgala,[30] a Sanskrit poet of the 13th century in his '*Kṛṣṇakarṇāmṛta*' praises God ' Viṭṭhala '. His contemporary Kannada poet Chauṇḍarasa commended ' Viṭṭhala ' in his '*Abhinavadaśakumāracharita*'.[31]

So far as the name ' Pāṇḍuraṅga ' is concerned two evidences may be noted. A damaged record[32] of the Chola king Tribhuvanacha Virarājendra-Choladeva dated twenty-first year mentions the temple of Pāṇḍuraṅgamuḍaiya-Nāyanār. A[33] multilated record of the Chola king Chakravartin Kullotuṅga-Choladeva dated 39th year, records a gift of land to the temple of Pṇḍuraṅgamuḍaiya-Mahādeva. Both the inscriptions belong to Nellore district of the Madras State. Two heroes named 'Paṇḍaraṅga[34] have been mentioned in the inscriptions of the Eastern Chālukyas. But these scanty references are not sufficient to show any relation with ' Pāṇḍuraṅga ' of Pandharpur.

In *Desināmamātā*[35] Hemachandra quotes 'Ruddammi Paṇḍaraṅga' among the words, the etymology of which could not be given. Here he took Paṇḍaraṅga and Rudra synonymous. On the basis of this evidence and the usual

practice of the pilgrims to visit the Śivaliṅga on the 'Samādhī' of Puṇḍalika and independent mention of 'Paṇḍuraṅgapura' and 'Viṭṭhala' in the present inscription, R. G. BHANDARKAR[36] emphasised that 'Viṭṭhala' had no connection with the name of city. It was given to the city on account of its containing a Śiva temple. But when 'Viṭṭhoba's' importance increased in later times Śiva was thrown entirely into shade and 'Pāṇḍuraṅga' became identical with 'Viṭṭhala'. This statement may be supported as follows. So far as the name 'Pāṇḍuraṅga' is concerned, the word 'Pāṇḍuraṅga' does not convey any auspicious meaning. It may be justified in the case of Śiva who has fair complexion, but in the case of 'Viṭṭhala' it may be cited as an epithet conveying exactly an opposite meaning when 'Viṭṭhala' is always described as black coloured.

In the history of sectarian cults, spread of any sect was solely dependent on the royal patronage. It therefore seems that with the spread of Bhakti cult and the patronage received at the hands of the Yādavas, Viṭṭhala might have usurped the place of Śiva, and later the epithet of Śiva was endowed upon 'Viṭṭhala'. The independent mention of 'Pāṇḍuraṅgapura' in the present inscription is sufficient to prove the identity of 'Pāṇḍuraṅga' and 'Viṭṭhala'. Sanskrit prototype of Pandharpur as '*Pauṇḍarīka kṣetra*' occurs in the Bendigere plates dated Ś1171 (A.D. 1249). But the inscription records the name of the deity as 'Viṣṇu' and not 'Viṭṭhala' or 'Pāṇḍuraṅga'. Contemporary evidence may be noted from *Caturvargacintāmaṇi*. Hemādrī while giving a list of famous places of Pilgrimage mentions Pandharpur as 'Pauṇḍarīkaṣetra' on the bank of the river Bhīmarthī where 'Pāṇḍuraṅga' is worshipped. But '*Bārhaspatyasūtram*',[37] which belongs to the twelfth century has not included Pandharpur or its prototypes in the list of the Vaiṣṇava places.

About the feudatory Keśava following remarks may be made. The Tasgaon[38] plates of Kṛṣṇa dated Ś 1172 (A.D. 1250) mention one Csandra who had a younger brother Keśava as the gem of the Yādava feudatories. The inscription beautifully describes in the conversation of 'Śukasārikā' the game of battle played by these two brothers. From the family history, given in the inscription it seems that Śatānanda, the ancestor of Chandra was a Gurjjara brāhmaṇa of Kṛṣṇātreya gōtra. He begot Śriyānanda; from him was born Jalhaṇa. His wife was Kumāradevī, daughter of Prabhāditya of Viśvāvasu gōtra. Their sons were Chandra and Keśava. The present inscription mentions Keśava with his father Śārṅga and son Bhānu. The inscription records 'Sitavāḍaka' the name of the family which suggests its southern origin. The family seeks its origin from Kaśyapa who is the father of all living beings. It is likely that the family might have belonged to Kaśyapa gōtra. It may therefore be said that the present inscription has introduced entirely a new brahmin feudatory family of the Yadava sovereigns which might be ruling over the Pandharpur region.

Another point that requires consideration is the celebration of the Āptoryāma *yajña*. Aptoryāma is the seventh institution of the Soma-sacrifice. No special significance like that of Rājasūya or Aśvamedha is attached to it and it therefore could be performed for the fulfilment of all desires. C. G. KASHIKAR kindly provided the following information regarding the essentials of Aptoryyāma.[39] The sacrifice should be performed on the bank of a river. The distance between the 'Devayajana' and the bank should be such that neither a wagon nor a chariot can go between them. The priest should be able to see the rising sun and the water of the river. The sacrifice should be performed in the spring season. Erection of a large pandal is essential. All these things can be well corroborated by the description given in the record and help us in concluding that the 'Āptoryāma' sacrifice was performed in between the bank of the river Bhīmarathī and the temple of 'Viṭṭhala' and not in the temple of 'Viṭṭhala' as stated by Cousens.[40]

It is interesting to note that in preference to other auspicious days '*Ekādaśī*' was selected as the starting day of the sacrifice, which is regarded holy in the Vaiṣṇava sectarian practices. Great importance is attached to it.[41] The Purāṇas[42] mention the merits of the observance of '*Ekādaśi Vrata*'. So far as the 'Pañcharātra literature' is concerned the earlier works like *Parama Saṁhitā*[43] and *Pauṣkara Saṁhita*[44] have noted very interesting evidences. *Parama Saṁhitā* refers to '*Ekādaśī*' as the day of Indra; while *Pauṣkara Saṁhitā* prescribes *Dvādaśī* as the day of Vāsudeva with the specific mention of fasting on previous day. *Bṛhatsaṁhitā*[45] records that on the 12th day Keśava should be worshipped. According to *Viṣṇudharmottara*[46] *purāṇa*, all dates were sacred for the great God Vāsudeva. He had no particular day. *Vaikhānasāgama*[47] mentions '*Ekādaśī*' as the day of Yama. *Jayākhya Saṁhitā*[48] which is dated in 5th century A.D. mentions that Kārtika '*Ekādaśī*' of *Śukla pakṣa* is very auspicious. It further states that a person who observes '*Ekādaśī*' may be either an ascetic or householder and may attain merit here as well as in the other world. From the evidence of *Parama Saṁhitā* and *Vaikhānasāgama* it seems that originally '*Ekādaśī*' was not the day of Vāsudeva. When Indra and Yama lost their importance, both '*Ekādaśī*' and '*dvādaśī*' were regarded auspicious with the growing popularity of Vāsudeva.

All this literary evidence may be well corroborated with the epigraphical evidence. The Vākaṭaka queen Prabhāvatiguptā[49] issued two grants on the Kārtika *Śukla dvādaśī*, where the observance of '*Ekādśī*' by the queen is implied. The Udayagiri[50] cave inscription of Chandragupta II records '*Ekādaśī*' of bright fortnight of the month of Āṣādha which is named as 'Śayanī'. Absence of '*Ekādaśī*' may be justified in the land-grants of the staunch Śaiva rulers like the Rāṣṭrakūṭas, but solitary instances in the records of the Guptas and rare occurrence in the inscriptions of the Badami[51] Chālukyas and in the Yādava grants, definitely show that the vrata of '*Ekādaśī*' though prescribed by Vaiṣṇa-

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vism to its best devotees was never popularly raised to the status of 'Parvakāla', like Amāvasyā, Paurṇimā, lunar eclipse and solar eclipse. A clear mention of '*Ekādaśī*' as 'Haridina' occurs in a Kanarese inscription from Hebbaḷa near Dharwad dated Ś 1170 (1248 A.D.) which mentions Pandharpur as Paṇḍarange.[52]

'*Ekādaśī*' of Jyeṣtha bright half, on which the 'Aptoryāma' sacrifice was performed is named as '*nirjalā*', because the '*vrata*' consists in not using or drink ing water except at the time of bathing or at '*Āchamana*'. In the summer month of Jyeṣtha, it is a great trial to go without water. Selection of '*Ekādaśī*' for the beginning of performance of the sacrifice shows a noteworthy synchronization of the ritual of Brahmanism and the rite of Vaiṣṇava sectarian cult. It may further be said that in the middle of the 13th century when the 'Vārakarī Sect' in Maharashtra was at the peak of its popularity the day of '*Ekādaśī*' was naturally raised to the dignity of 'Parvakāla'.

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Text[1] (Pls. V-VI)

Verses 2.3.13 Anuṣṭubha, verses 1, 4, 5, 12, 19 Shārdūlavikrīḍita. Verses 9, 17 Vasantatilakā; verse 10 Mandākrantā; verse 15 Shikhariṇi.

1. सिद्धम्[2] स्वस्तिं श्री शकु ११९२ प्रमोद संत्र त्स (रे ज्ये)
2. ष्ठ सुद्ध ११ रवौ । अद्येहं श्रीमत्प्रौडप्रतापचक्र (वर्ति)
3. महादेव विजयराज्योदये । येन त्रीणि जगंति जन्म धि भ – – ⌣
4. निवक्त्रादिर्भिर्भोश्वद्वक्त्रसरोरुहाणिवहतस्तेजांसि यस्या ⌣ –
5. वेदानां हि करंडक (त्रि)[3] मुनयो ध्यायन्ति यं नित्यशो व्रह्मांभोज (स)
6. मुद्भवो विजयते देवः स वा (णी[4]) पतिः । १ ॥ श्रीमद्राणीमनोन्मेष वे (दैः)

7. विजयते विभु[6] । उद्यदुग्धनिधिश्लिष्टा सुधाकरकरोपमं ॥ २ ॥
8. तेन मानसजन्मानो ब्रह्माणो जनिता नव । आत्मनो दीप्तमूर्तेन
9. गुणाबुद्ध्यादयो यथा ॥ ३ ॥ तत्रासीज्जनकः सुरासुरकुलश्रेणेः सु
10. धा संश्रितः[8] प्रारूडा सुदृढं मुदा मुखरवानान्या सधार्य सुश्री किं
11. श्वेत्र मदांधमहितरिपुं ॥ विष्णुर्विजिष्णुं यथा । श्रिंगारं[7] भुवि ‿ ‿
12. मेषु यदि वा सेतुः स्वतां कश्यपः ॥ ४ ॥ वंशेतस्यशशिप्र
13 काश विशदे संसेविते संततं शीलाद्यैर मलैर्गुणैरिह व (भौ)
14. श्रीशार्गनामा कि ऽ ऽ ती येदः सोदितमादरेण भवने
15. शयं कर्मणा देहं प्रापकिलेत्रसादितरजाः जानंन्य (था)
16. ध्रुवं ॥ ५ ॥ तत्सुनुः सितवाडकान्वयभवोभूभारभंगाय – –
17. क्षात्रिणक्षत शत्रुक्षितितलासार्ध स्फुरत्तेजसा । दौर्जनापि
18. निजेनरंजिततनु श्री जामदग्न्यो यथा कीर्तेः साहसिक मंडलीक
19. प्राभूत् यः केशवः ॥ ६ ॥ अपि च । रणे वितरणे वा पि यद्दोर्भारवहा
20. अभिभूयेव भवनं कांचनैरकांचनैरपि ॥ ७ ॥ अलंकुर्वन्ति कर्णातं पू –
21. ने वा परांगनाः । मार्गणामार्गणायश्च कंकणै[9] श्कंकणैरपि ॥ ८ ॥
22. यद्वैरिवर्गवनिताकुच मंडलानि यस्वीक्रीतेध[10]नजितानन कालि
23. ने । मुक्तानि भिल्लनिकैररपि लज्जयेव नाथो द दुखित गुण निपतंति
24. सद्य ॥ ९ ॥ यद्दानार्णो जनिततरवो य (   ) प्रावषंडा यद्भोगे
25. तरु च यो गोगणामार्गणानां द्युस्त्रा नानामभिमत न
26. वर्तये सोयं मर्त्यैरगणितगुणः[11] केशवः कथ्यते किं ॥ १० ॥
27. न गैर्वकार्मुकंनसन्मौ विं झांकार
28. ग भवैसिक्तासुरक्ताद्रि । रेजे छंनशिरश्निनां श्रितुमती
29. प्रयात मृणां नयनांबुभिश्चवत्रसुमै – – – राजि क्षितिः ।
30. प्यद्भुतसंगराहतपुरित्रातांगनानांकचान्वक्त्राण्यवुरुहाणि
31. स्तुमतीबालव्रजान्लापयंश दावाग्नि क्षपयेनिवौनतरां (भा) तं ग
32. भा कुचानोष्ठान्मंजुलपल्लवान्विजयते यद्विक्रमो दुर्धर : ॥ १२ ॥
33. गंधर्व क्रितद्रैस्वीतस्य भावनायान्वितः । मतं कुमारिलस्येव मुनु भा (नु)
34. (प्र) शास्ति गां ॥ १३ ॥ यद्वैरिवक्षक्षतजा द्वैवीर क्षिति प्रविष्टा मु
35. विषोमा । भास्वप्रकाश व्रतत प्रभूते यशांसि भास्वति – – – –
36. १४ ॥ यदा स्य द्राक्षव्रतति वितते मंटपवरे गुरुश्रीवेतः सह –
37. हरिदुर्वीरुहांकिते । वितेनानातारफलनिभिराकांत गगने
38. विरेजे – – – धवल घटशंका पट भिते । १५ ॥ कौशिकः
39. कौशिकायेव आप्तोर्याम सवार्थिने । वसिष्ठा ये व
40. श्रीमत् श्रीशर्म यच्छति । यस्यव्रतं विसर्ग
41. दातप्रतिग्रतादिर्वभीतमीता । नाकं सुरा परिविहाय मनुष्य (लो)
42. के मापु स यथा कांक्ष यज्ञाः । १७ ॥ द्वैपायनापादित
43. द वेद शालफलयेत पुनर्द्विजानां । ऐ   चक्रारापजहारता

44. यक्षी चतुर्वेदिपि महोर्ण । १८ ॥ सो यं भीमरथीगुणेन

45. – – – – – – सो रच्छ ले भास्व त्कीर्त्तिमहामणि प्रतिनिभे श्रीपांडुरंगे

46 पु रे । अम्रोर्यममहेष्ठिकाचितियुतं श्रीशर्मयज्ञाकरी या

47. प्रीतिमवापलोकनिवहै देवैरसौ विठ्ठलः ॥ १९ ॥ मंगलम् ।

(1) From the impression and original.
(2) Expressed by a symbol.
(3) The intended meaning may be '*Karaṇḍakastrimunayo*'.
(4) The letter '*ṇī*' is added afterwards just above the letter '*Vā*'.
(5) The intended reading may be '*Vibhuḥ*'.
(6) The intended reading may be '*Sambhṛtaḥ*'.
(7) The intended reading may be '*Sṛṅgāram*'.
(8) Sign of *jihvāmūlīya*.
(9) —do— —do—
(10) —do— —do—
(11) —do— —do—

THE CHARACTERISTICS OF THE PLEISTOCENE CLIMATIC EVENTS IN INDIAN SUB-CONTINENT — A LAND OF MONSOON CLIMATE *

R. V. JOSHI

THE CLIMATE of the Indian sub-continent is typically monsoonal characterized by the seasonal rainfall mostly occurring during the summer months. Within this land-mass the varied relief has affected the distribution of rainfall causing contrasting climatic types of very dry to intensely wet climates. More or less the same climatic pattern was prevailent during the Pleistocene period.

The studies of the Pleistocene deposits, which in places have yielded Stone Age relics, in this sub-continent have revealed interesting features. In the sub-Himalayan region due to heavy precipitation on the hills of high relief intense mechanical erosion seems to have taken place resulting in the accumulation of huge cone deposits at the foot of the hill ranges. At least four such ancient cone formations have been observed in the Kangra valley where characteristic ancient moraines, however, were not seen. These four cone formations may be equated with the four glacial phases of the Pleistocene period. The high level river-terraces which occasionally contain Early Stone Age artefacts in this region have developed on these cones.

In the Indian Peninsula which never witnessed glacitation, two cycles of Pleistocene river deposits have been observed denoting only two distinct pluvial phases. The relationship of the pluvial phases of the Indian Peninsula with the cone formation in the sub-Himalayas can be established by observations on the rivers which emerge on the Indo-Gangetic plain after traversing the Himalayan zone. Perhaps the pluvials in the monsoon land correspond with the interglacials of the northern higher latitudes.

The South and South-East Asian countries form a compact land mass. The enormous bulk of this land, its barren interior plateaux, temperate and sub-tropical latitudes, the large expanse of warm seas which flank it on the south and east, all combine to produce the contrast between continental and oceanic influences and give rise to land-and sea-breezes on a gigantic scale (A. MILLER,

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1946). The rain-bearing winds of this part of the world are the winds which originate from the eastern and equatorward sides of the sub-tropical highs and move towards the equatorial low. Over the oceans in the south they are constant winds in their force and in their SE, SSE, or ESE direction but in the vicinity of the southern border of the continental block they are deflected from their normal westward direction and thus result into typical monsoons.

With certain exceptions this tract receives its rainfall during summer and the winter is characterized by partial or complete drought. In this respect the monsoon climates resemble normal tropical climates, but they differ markedly in the amount of rain received and in the incidence of such rain within the rainy season.

All over this continental block monsoonal climate was prevailing during the Pleistocene period and like other climatic belts which witnessed marked climatic variations, it must also have experienced fluctuations in the amount of rainfall.

Although belonging to the same monsoonal climatic zone various parts of this land-mass such as the Indian sub-continent (including India and Pakistan), Ceylon, Burma, Malaya, Indonesia and China, on account of their varied relief and other factors, have developed regional climatic types which may have persisted during the Pleistocene period also.

All these lands have yielded remains of Stone Age man in the form of stone artefacts and rarely human and animal fossils in the stratified deposits. The correlation of the stratigraphy of the various countries, however, faces considerable difficulties as it cannot be attempted by adopting a single method.

North Indian Region

In the north-west of Indian sub-continent the Pleistocene chronology was worked out by De Terra on the basis of suggested relation of the river terraces on the Soan river, a tributary of the Indus in West Pakistan, with the deposits of the Himalayan glaciation (DE TERRA and PATERSON, 1939). DE TERRA and MOVIUS (1943) regarded the terraces in the Irrawaddi valley of Burma as aggradational during pluvial phases which were correlatable with the glaciations as this river is also fed by the glaciers in its source region.

The discoveries of the Early Stone Age chopper industry on the high level river terraces in the Kangra valley in the Himachal Pradesh, India, (LAL, 1956) provided further opportunities in testing the feasibility of this method in the Indian region.

During the last three years' work in this valley the sites yielding handaxe industries along with the chopper group of the Early Stone Age have been found (JOSHI, 1968) and fresh data on the terrace deposits and Pleistocene events have been obtained. Although practically all the streams in the Kangra

valley possess high level terraces they are better exposed and have better continuity and expanse on the Banganga river. This river, a tributary of the Beas, shows five terraces at Guler almost near its confluence. The Beas proper also has developed terraces. In fact this is a common morphological feature of the region. Since all the streams eventually drain into the Beas the terraces will have to be finally linked with the Beas system (Fig. 7).

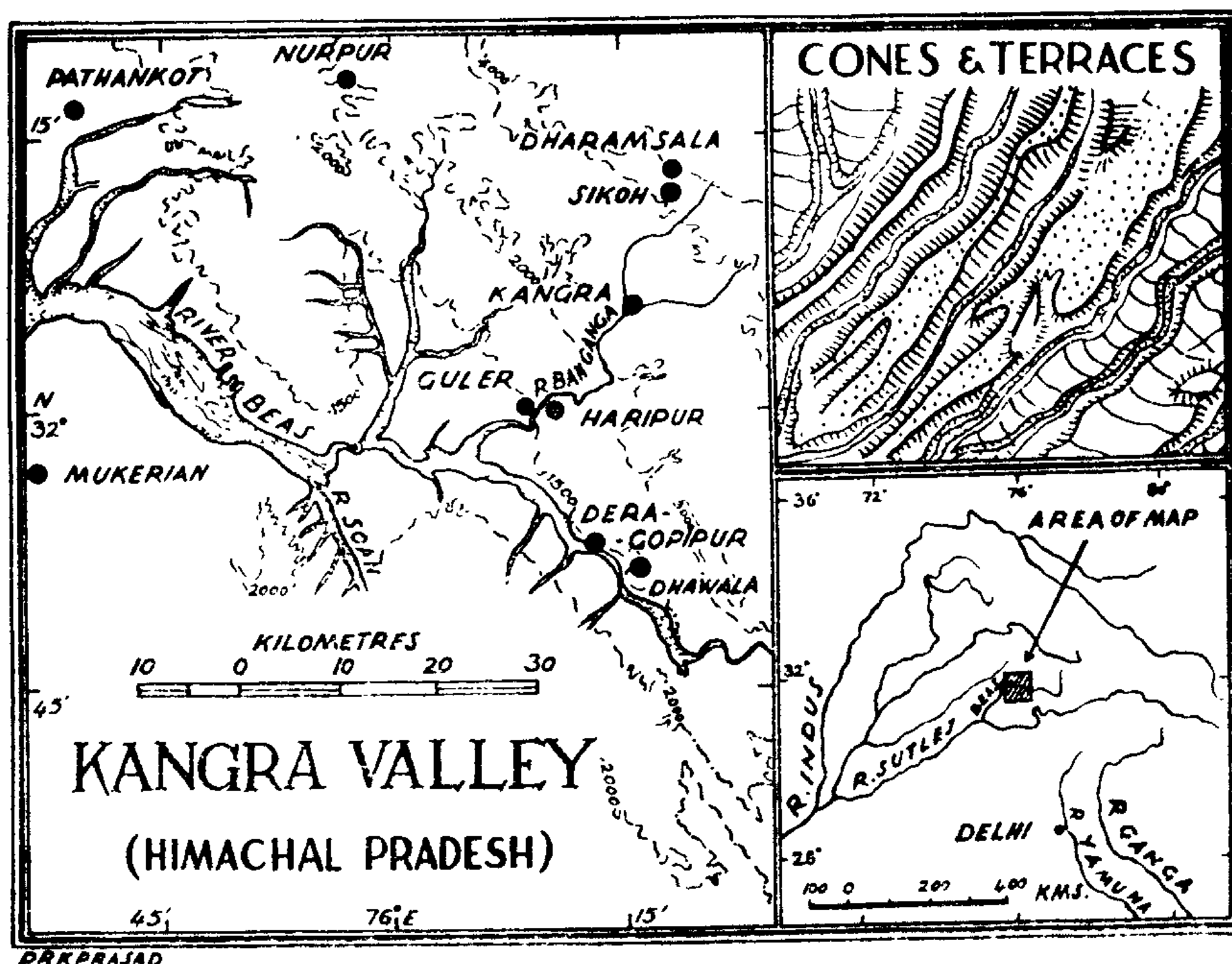


Fig. 7

The terraces at Guler (32° 1′ N, 76° 9′ E.) are cut into the Siwalik rocks (Middle Miocene to Pleistocene) (MATHUR and SAHNI, 1964) and occur respectively at 183 m (T_1), 125 m (T_2), 50 m (T_3), 30 m (T_4), and 10 m (T_5) above the river bed (Fig. 8). Each of them has a deposit that is characteristic in the enclosed pebbles of rocks and weathering. The T_1 and T_2 are underlain by about 2 to 3 m. deposit comprising mostly of huge well-round unstratified boulders some measuring over 1 m. diameter, of quartzites and sandstones with comparatively little mixture of metamorphic and igneous rocks and the red brown clay. A notable change is noticed in the composition of T_3. It contains a large quantity of granitic and gneissic rocks and the quartzites and sandstones are subordinate. The granitic rocks are also less weathered. The material of T_4 and T_5 is derived from the higher terraces.

LONGITUDINAL PROFILES & SCHEMATIC VALLEY SECTIONS
KANGRA DISTRICT

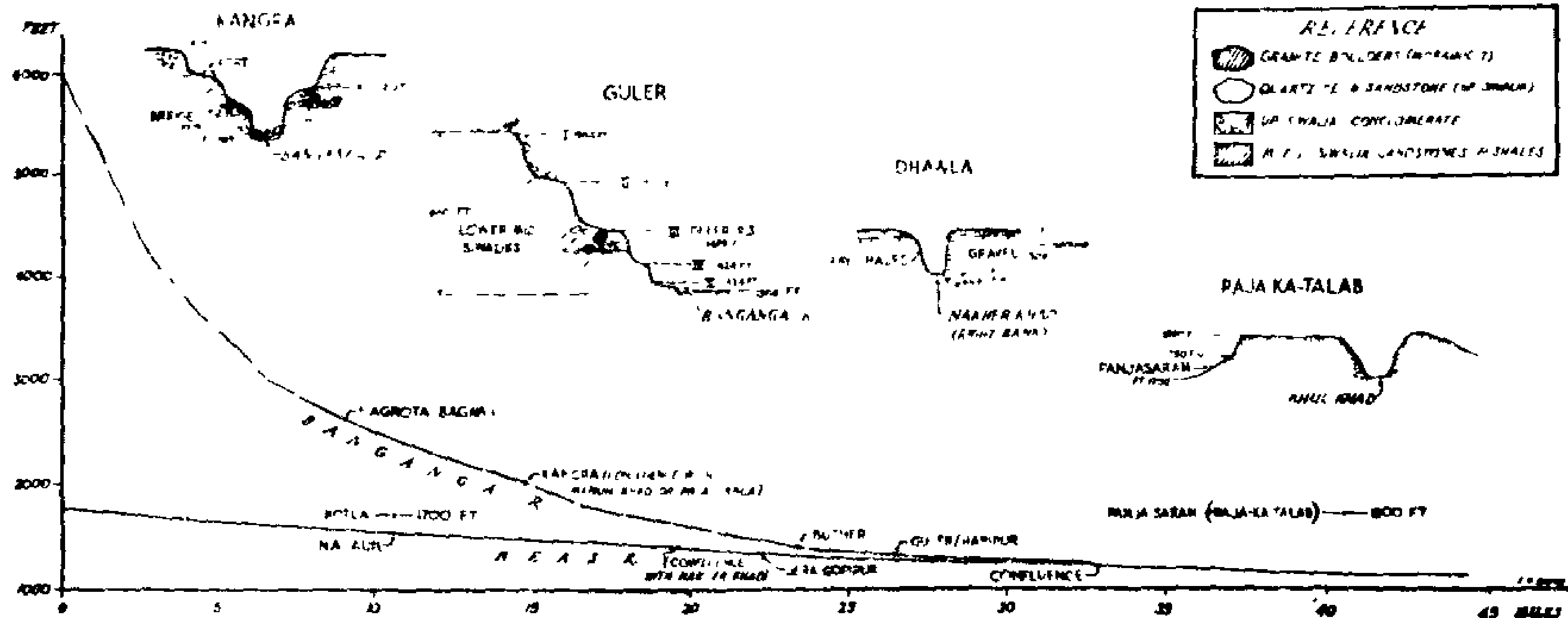


Fig. 8

The occurrence of granitic material in profusion in the terrace T_3 deposit and its erratic nature were first thought to be due to the moranic cause. Thus this was considered as a clear evidence of glacial action. The quartzite boulders from the terraces T_1 and T_2 also, in one sense, are erratic because the underlying Siwalik sandstones and shales are softer and do not have any beds of this kind of quartzite. The occurrence of such quartzite blocks on a terrace at a height of nearly 180 m. above the present river bed, therefore, have to be explained as due to glaciers as no stream would be powerful enough to transport quantities of such very coarse material at high levels.

MEDLICOTT (1865) had observed the presence of granite and quartzite boulders at a height of over 100 m and he had explained that the erratics of Kangra were brought by the floating ice. THEOBALD (1874) subsequently explained this phenomenon as due to glaciers and further postulated that nearly seven glaciers had descended in the region.

There are certain difficulties in accepting the occurrence of glacial moraines at successive terrace levels. Within the explored area there are no remnants of moraines either of lateral or end or terminal type. The components of the loosely cemented bouldery gravel containing granite and quartzite rocks in the terrace deposits are fairly rolled and rarely one comes across angular debris even in the areas close to the foot hills. Similarly the boulder clay deposits characteristic of glacial origin are also not noticed. The V-shaped valley forms in the adjoining Dhauldhar range seem rather due to stream actions and not as a result of glacier movements. On the southern slopes of the hills the cirques are presently located at high altitudes but none is seen at lower levels from which the ancient glaciers could have emanated.

The Dhauldhar range rises abruptly causing very steep southern slopes above the general low-lying area in which lie the beds of several streams. These slopes come under the direct attack of the monsoon rains with heavy snow accumulations at higher altitudes. The snow then moves suddenly along the steep slopes. Thus due to the action of rains and moving snow the exposed rocks are stripped off and the debris falls as talus at the foot of the hills building up huge cones. This cone material is further carried away by water either in the form of gravel fans or as a river gravel.

It may be mentioned here that no glacial morphological forms are visible below 5000 m. on the southern slope of the Dhauldhar range and there is no movement of ice in the form of glaciers. The hill forms in this area are due to snow and monsoonal rains. The Kulu-Manali area in the upper reaches of the Beas, however, possesses such glacial features and at one place, about 10 km. from Manali on the road an ancient lateral moraine was noticed.

Both the quartzite and granitic rocks occurring in the terrace deposits in the stream valleys have no outcrops in the Dhauldhar range or to the south of it. The source of this rock material is in the hill ranges north of the Dhauldhar range from where it must have been brought by the streams and discharged in the Banganga and other rivers.

It is also possible that huge lakes might have formed due to blocking of the stream channels by the talus accumulations at the base of the Dhauldhar range, thereby impounding large volume of water. The subsequent bursting of the same might have caused extensive spreads of the sediments. The later streams have entrenched their beds in this loose material.

Thus the whole mechanism of cone formations of great thickness of 100 to 150 m is a process of erosion of the rocks exposed on the steep slopes due to heavy monsoon precipitation in the form of rain and snow. This local rock material got mixed up with the one discharged by the streams coming from the inner ranges and the whole further moved by the resulting streams.

After the formation of the cone at a particular time it was later dissected by the streams. A large portion of the cone was eroded leaving a few remnants on the banks in the terraces. The cone of the next period partly overlapped the older cone and spread out further at the level lower to the earlier cone. A part of this cone material was carried away by the streams which became heavily loaded. Into this second cone material was cut a new terrace at a level lower to that of the earlier terrace. Thus there were alternate periods of accumulation and erosion of the cones. During the same period the mountain building actvity played a significant role in raising these terraces at higher levels.

Four stages of cone formations have been noticed in the area. The highest and the oldest of them (Sikhov-I) occurs at an altitude of 1166 m near the

village Sikhov, not far away from the Dharmsala town. The Sikhov-II is in the same locality and at an altitude of 975 m. The Kangra-I and Kangra-II are the later cones. The four terraces observed in the Kangra valley can be related to these cone formations.

There is no definite faunal or any other evidence which could be utilized for dating the various cones mentioned above but perhaps they could be assigned to the four major glaciations.

Although it is stated above that the cones have not been caused by glaciers, they seem to have been formed definitely during the periodic climatic changes as witnessed in the periglacial areas. Thus they may better be equated with the pluvial and interpluvial episodes of the Pleistocene period. In view of the special geographic situation of the area and the characteristic effects of the monsoon rains and snow formation this region may be described as ' monsoonal periglacial ' zone.

Peninsular India

The Peninsular India which constitutes a sizeable area of this Asiatic land-mass has many distinct features that necessitate its independent treatment. It never experienced glaciation nor it was affected by the peri-glacial climate during the Pleistocene period. Its peculiar relief features greatly influence the rainfall distribution although it is chiefly derived from the SW-monsoons (KENDREW, 1957). The area is very rich in Stone Age sites and at some localities fine sections of implementiferous Pleistocene deposits are also available (JOSHI, 1955; SANKALIA, 1962) (Fig. 9).

The palæolithic sites so far discovered in the Peninsular region occur mostly in two latitudinal zones namely (i) the southern tract lying approximately between the latitudes 12° and 16° which includes the rich and important sites of Madras area, the sites on the Krishna and its tributaries like the Malaprabha and Ghataprabha, and a few on the Godavari, and (ii) the Central Indian region within latitudes 20° and 24° containing the sites on the Narmada Sabramati and Mahi on the west and Mayurbhanj, etc., in the east. These two zones are distinct in their physiographic setting, rainfall distribution and orientation of dranage system (SPATE, 1957).

A study of several exposed sections, many of them containing artefacts *in situ* reveals two main aggradational phases each beginning with the gravel and ending with the silt. On the basis of enclosed fauna, particularly on the Narmada and the Godavari, these deposits have been dated to Middle-to Upper-Pleistocene. At some localities a sand bed replaces the gravel and/or silt deposit. On the top of these lie the sandy gravel followed by the surface black or brown soils.

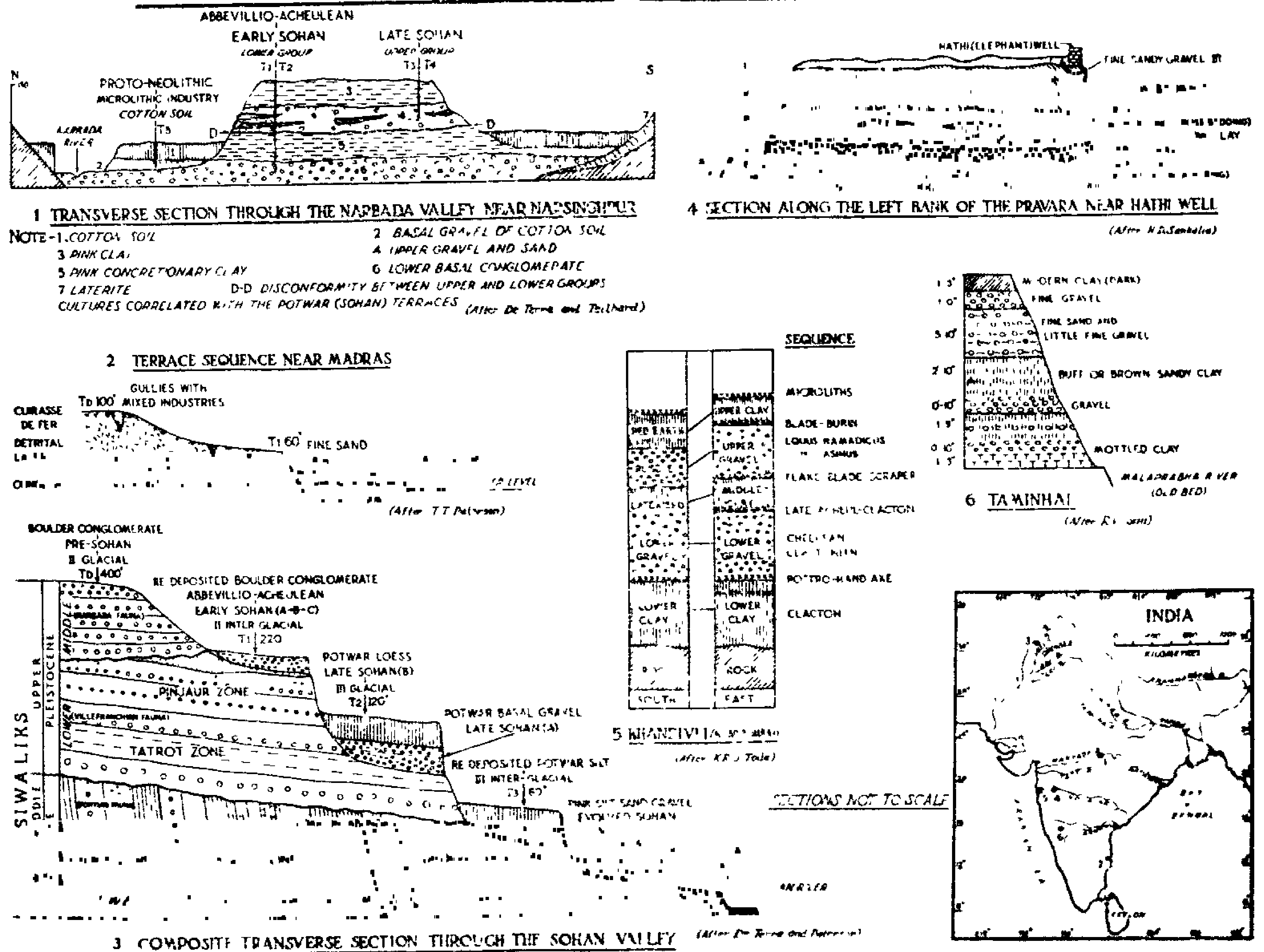


Fig. 9

The first and the oldest Pleistocene deposit yields the Early Stone Age industries while the second contains the Middle Stone Age industries. Although there is some erosional disconformity between these two aggradations the erosion seems to have been quite intensive after the deposition of the second gravel and silt whereby in some tracts the unconsolidated tool-bearing upper-gravel has been considerably disturbed and a large number of Middle Stone Age tools have been thrown out of stratigraphy in the loose river gravels.

In some tracts the gravels containing Middle Stone Age artefacts are the only tool-bearing strata. At places they occur even at the lowest levels and are subjected to erosion caused by seasonal floods.

After these depositional and erosional acaivities in which the streams played the major part, the wind action seems to have become more intense in some

regions and to these belong the early microlith (Mesolithic)-bearing sands and silts.

Correlation between the Northern and Southern Regions in India

De Terra and Paterson (1939) equated the Pleistocene Potwar terraces (from Pakistan) with the fauna of the Narmada region on archaeological grounds although the latter area lies outside the farthest limits of glacial and periglacial climate. Earlier, Burkitt and Cammiade (1925) had also established the correspondence of the stratigraphy and industries of the South Indian Stone Age sites with those of Africa again relying more on the archaeological material.

Zeuner who studied the climatic sequence of the Pleistocent deposits in Gujarat in Western India concluded that following the basal laterite phase of unknown age there is a sequence of aeolian and fluviatile deposits indicating dry conditions (Zeuner, 1950). Recently three fossil soil horizons have been noticed in the lower Narmada valley on the basis of which Wainwright (Wainwright, 1964), has dated the Narmada river gravels yielding Early Stone Age industries to the Last Interglacial. But since this region seems to have been subjected to tectonic action even in recent times, while evaluating the Pleistocene sea-level changes this factor will also have to be considered.

The soils from the Narmada basin show complete absence of pollen grains. In fact, excepting the Karewa silts in the Kashmir valley, none of the Pleistocene sediments have so far yielded any pollens.

Of the several methods employed in interpretating Pleistocene stratigraphy at one locality or in correlating the stratigraphic data of several localities situated in the northern and southern Indian regions, only two methods seem to be of some importance at least presently. These are the paleontological method and the method based on the study of river deposits. The faunal evidence, however, has not been proved very useful as yet in distinguishing between the Middle- and Upper-Pleistocene horizons in the Narmada and the Godavari rivers.

The formation or building up of the geological deposits depends to a large extent on the climatic environment of the region. As far as Indian sub-continent is concerned it is pre-eminently the land of tropical monsoon climate and hence this is the type area for investigating the behaviour of monsoon climate during the Pleistocent period.

The monsoon and naturally the amount of rainfall it countributes depends on the heating of the Asian continent. During glacial times a colder Asia must have attracted a less powerful monsoon. It will, therefore, mean that in the cold phase (glacial in higher latitude) of the Pleistocene there must have been dry climatic (low rainfall) conditions on tropical monsoon lands

unlike the pluvials in the peri-glacial areas. Thus the glacial phases in higher latitudes will perhaps correspond with the low rainfall periods in the monsoonal lands (JOSHI, 1961).

While discussing the climatic sequence in Gujarat, Zeunder writes, " The assumption has often been made that the pluvial phases in the equatorial and monsoonal belts (collectively called tropical zone) were contemporary with the northern glaciations, but it has never been possible to prove this. The evidence obtained on the Sabarmati now suggests that the situation is more complex, and that the inerpretation of Pleistocene deposits in terms of climate has to be worked out independently for the tropical zone, before a climatic correlation is attempted (ZEUNER, 1950)".

The problem of tropical pluvials can also be dealt with by considering the position of caloric eqator at various times but as Zeuner has pointed out, it is difficult to assess the effects the fluctuations of the caloric equator in the tropical zone although such effecs can be understood on the northern and southern dry belts (ZEUNER, 1958).

CHARLESWORTH traces the cause of pluviation of the Indo-Gangetic plain as well as of the south India, in the Himalayan glaciers, which caused storminess along the contact of the southerly monsoon with the cold front to north, which gave greater moisture to the Indo-Gangetic plain. According to him the winter monsoons of the Bay of Bengal, as over Asia generally, gained in force and brought more rainfall to south-east India (CHARLESWORTH, 1957).

The increase in rainfall in the equatorial belt during the Pleistocene glaciation may have been due to the concentration of pressure belts in the equatorial regions which strenghtened the circulation of the trade winds (A. MILLER, 1946).

It will be interesting to see the results of the Pleistocene studies that have been made in the African region lying between north latitude 5° and 25° which are also approximate latitudinal limits of the Indian Peninsular region.

The dry belt which lies to the south of the Mediterranean zone comprising the Sahara, the Arabian desert and corresponding countries farther east, is still influenced by the weather of the Mediterranean zone. As a link between the Mediterrancan and tropical zone Kharga Oasis in Egyptian Desert, on 25°N. lat. is a typical locality for the Pleistocene climatological studies. But even here there is no geological proof for assuming that the Mediterranean pluvials made the climate of the Sahara damper than it is to-day (Zeuner, 1958).

Yemen and Hadramaut (15°N. latitude) in south-west Arabia are the other regions in Africa that have been studied systematically. The climate of south-east Arabia, which lies on the southern edge of the dry belt, is influenced by the monsoon, and it is more likely that the pluvials observed under this latitude correspond to pluvials of tropical zone. Zeuner observes that there is no evidence that the tropical pluvials were contemporay with those of the Mediterra-

nean region, so that a correlation cannot even be attempted. It may be added here that Abyssinia (50° and 12°N.) had dry trade winds during glacial times (A. Miller, 1946).

Zeuner considers the Saharan pluvials as the result of a northern position of the caloric equator coupled with a Mediterranean pluvial whenever there was a glaciation in northern Europe (Zeuner, 1958).

In attempting correlation of the pluvials with the glacial phases SIMPSON (1957) has pointed out that although each pluvial begins and ends during a glacial phase its centre does not coincide with a glacial phase; on the other hand the centre of each interpluvial does coincide with an interglacial. It is this complication which makes it practically impossible to correlate the pluvials with the glacial phases from field observations alone. According to him there were only three glacial phases and only two pluvial phases.

While analysing Simpson's hypothesis Zeuner remarks that " It appears that we are not yet in a position to make definite statements everywhere about the effects of solar radiation on the climate, at any rate on the warmer parts (tropical) of the earth's surface, unless we restrict ourselves to the realm of pure hypothesis."

While writing on the timing of arid-humid phases in Africa FAIRBRIDGE (1964) has observed that the ancient desert dunes should not automatically be correlated with warm phases of the geological past, but possibly with cold episodes. Further he has referred to Flohn's work according to whom there would be 20% less evaporation for warm latitude oceans during glacial stages. This would mean less tropical cloud, a reduced energy for the monsoonal winds, and a lower rainfall for interior regions. (The rain-shadow belts such as the one occurring in the east of the Western Ghats in southern India introduces further complications in the monsoonal rainfall distribution.)

After considering all the available important data it appears that although the attempts have been made by several research workers to explain the Pleistocene climatic chronology as depicted in stratified geological deposits in various parts of the tropical and particularly the monsoon lands there is no agreement as regards the exact relationship of pluvials of this area with the glacial phases in higher latitudes. As pointed out above the monsoonal belt of the world has certain climatic peculiarities and it is not known how this region reacted to the glacial phenomena in higher latitudes during the Pleitocene. If the geological deposits of the Pleistocene in Peninsular India are considered then there seems to be an evidence of only one intense pluvial phase (lower bouldery gravels containing Early Stone Age industries) and one or more minor pluvials or sub-pluvials thereafter.

It has been experienced in the sub-Himalayan region that due to their peculiar physiographic situations the Kashmir valley, the Kangra valley, the Upper Beas

valley, as also the Chamba valley beyond the Kangra valley have developed different glacial and periglacial characteristics. While attempting the relationship of the pluvial phases of the Indian Peninsular area with these regions, therefore, this factor cannot be ignored.

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STATISTICS IN ARCHAEOLOGY

V. S. LELE AND N. N. KOTI

THE SCIENCE of statistics often helps to understand many phenomenon. Statistics has been generated by the collection of numerical facts or records of data. Quantitative type of information about a single body or a group of bodies, observed repetitively creates statistics. Huge mass of such data necessitates the aid of scientific methods to appreciate and understand the facts contained in them. It is here the use of statistical methods comes to our rescue.

The archaeologist is forever seeking to reconstruct the past, to describe as much of a former culture as possible from the remains found in the ruins left by earlier inhabitants. While exploring or excavating a site he comes across a large amount of data especially in form of tools and pottery.

Analysis of archaeological observations which are measureable and can be recorded in quantitative figures has been brought in practice quite recently. Albert C. SPAULDING[1] has fitted a 'Normal Distribution' to the data of lengths of 97 projectile points. He has applied the X^2-test of goodness of fit and has indicated that the distribution of Point Lengths follow a Normal Law.

L. VERTES[2] has employed statistical laws more extensively, for deriving useful inferences. He studied lengths of blades found in an excavation site at Akra, Northern Hungary, during 1961-63. He believed that the Palaeolithic man had some preconceived idea of the implement to be made and therefore he had to approximate to his ideal length. This concept underlying the 'Normal Distribution' in statistics did not hold apparently when Vertes obtained the distribution of Lengths of Blades and found them 'markedly different from expected'. However, on closer examination of the distribution giving different peaks, he found that his sample consisted of a mixture of Blades from different sites, or makers or materials. Thus, he utilized these analytical methods to discover heterogeneity or homogeneity in the data. He found that blades received from the occupation sites and the factory sites, gave average lengths differing by 9.2 mm and he suspected use of local raw material in manufacture. Further, he found that the Average length of blades from the excavated squares and the percent content of Limnoquartize found in same groups are related to each other. He then used 'The Method of Regression' to prove that 'Every single percent of limnoquartize used by Palaeolithic man had increased the average length of blade by 0.34 mm.'

CLARKE has applied 'Matrix Analysis' to the data of Beaker pottery in 1962. There he suggested that similar methods can be applied to the field of Handaxe typology. Induced by this, ROE[4] started to examine his collections of Handaxe data for some statistical analysis and presentation. He insisted 'that the material and the data themselves should be always available, directly and without disguise, to others for their own objective study and for comparison, and for the making of alternative deductions if they so desire'. He used measurements on Lengths, Breadth, Thickness and Weight on each Handaxe to examine the 'Standardization' in Industry or to 'Isolate' the groups from a mixture due to different causes and to derive important inference about Shape, Size and especially the 'Refinement' in Industry according to time. The absence of a Peak in the observed distribution of Lengths led to lack of standardization or induced further probe for finding out the cause of non-standardization.

Utility of various statistical methods in Archaeology can be best demonstrated with reference to the data observed on numerous Handaxe or Bifaces obtained in an exploration or excavation site. This is one of the earliest tool. The basic measurements are taken on the Maximum (i) Length (ii) Breadth (iii) Thickness and (iv) Actual Weight of each handaxe. Information on the material, the levels at which these are found and the relevant aspects, if any, are also recorded.

Variation Necessitates Statistics :

Variation is inevitable in nature. Variation of length from Handaxe to Handaxe may be due to

(a) Errors of observations or in measuring the lengths, by different instruments, men.

(b) Lack of uniformity while manufacturing the Handaxes.

(c) The groups of Handaxes under study may be a mixture from two different locations, times or materials.

The quantitative data on lengths thus collected can be subjected to statistical analysis as under :—

1. Data can be grouped or separated according to each cause, such as instruments, observers and studied separately.
2. Data of each material, time or site be sorted out and kept distinct.
3. Above analysis will give the possible cause of variation.
4. After eliminating such causes there still remains variation in length from Handaxe to Handaxe in each of the above groups, which now cannot be removed and is the inherent variation which, in practical situation, will always exist. This variation is usually called as random error or chance error.

Many a times it is not so easy to group the data as mentioned above according to each cause, but such causes can be evolved at a later stage after the analysis is done.

Simple Statistical Procedures :

Information collected on several hundred lengths on different Handaxes can be compiled or abbreviated by the following simple statistical procedures.

1. MEAN OR AVERAGE :

This is obtained by totalling the lengths (L) on all the axes and dividing it by their total number N. Then,

$$\text{Average } (\bar{L}) = \frac{\text{Sum of all lengths}}{N}$$

This is commonly known as the Arithmetic Mean. This gives the idea of a figure about which the lengths of all the individual Handaxes are centered.

2. STANDARD DEVIATION :

The data of lengths vary from one Handaxe to other and it is thus necessary to have the idea of 'Average Variation' similar to the 'Average Length'. The variation of the individual length is generally measured from the 'Average Length' worked out earlier, which we note as $(L—\bar{L})^2$. The standard deviation is then given by

$$S = \sqrt{\frac{1}{N}(L-\bar{L})^2}$$

3. COEFFICIENT OF VARIATION :

The standard deviations of two different groups or samples may be different. But higher standard deviation does not always mean more 'Variation'. The value of 's', the standard deviation increases proportionately with the increase of 'Average Length'. Because, smaller lengths can be measured with more refined instruments to be more accurate, while for higher lengths, in practice, we tolerate a slightly higher error. Thus, to appreciate the variation in two different groups or to make a statement that one is more variable than the other, we work out a measure 'coefficient of variation' given by $C.V. = \frac{S}{\bar{L}} \times 100$ which is now free from the effect of 'Average Length'. Now more the value of C.V.% more is the variation in the particular group. This measure often is useful to compare variations in two altogether different characters or implements such as, Cleaver, Scraper etc.

4. FREQUENCY DISTRIBUTION :

It is generally expected that when Handaxes are manufactured at one place some ideal length or the standard length is kept in view. Most of the Handaxes will be near to this ideal length and very few will be widely different from it. The departure of any individual length from this ideal is normally due to the discrepancies in the manufacture, the variation in the skill or the errors of observations etc. The observed data on length is now grouped in different 'Groups of Lengths' and the number of Handaxes lying in these group lengths is recorded. This, thus gives a 'Frequency Distribution' for the Length of Handaxes (See Appendix-I).

A frequency distribution having a single peak only is assumed to represnt a homogeneous set of data (fig. 10b). If such a frequency distribution does not give a definite peak, it reflects lot of heterogeneity and complete absence of any ideal length (fig. 10c). On the contrary, if the data is a mixture of two different groups, having different behaviour it will be reflected by two separate peaks in frequency distribution (fig. 10d).

The method of smiple classification as above thus helps to disclose heterogenity or homogenity in the data.

5. CORRELATION AND REGRESSION :

When data is collected on different characters such as Length, Breadth, Thickness simultaneously on different Handaxes, it is interesting to see how the different characters are related to each other. The 'Coefficient of Correlation' measures the degree of association between any two such characters, while a law of relation of the type $y = a + by$ or any other, if established will enable to measure 'y' from the knowledge of 'x'. If for example character 'y' is observed for about 40 implements while simultaneous observations on 'x' are available on 50 implements only, the law of relationship can be worked out on the basis of 40 implements which have both x and y data. 'y' on the remaining 10 implements can be estimated on the basis of this established law.

If at any site several hundred tools are found, then such laws can be established on the basis of about say 50 observations simultaneously for all the characters, Length, Breadth and Thickness. Only one character, say length, be observed on the remaining hundreds of tools and the time need not be spent for observations on Breadth and Thickness. These will now be estimated from the established laws.

Hence, when characters are related to each other, knowledge of only one character (Say Length) will be necessary and the remaining characters (Breadth and Thickness) need not be observed but estimated from such Laws. This saves money, time and labour in making observations on all the characters.

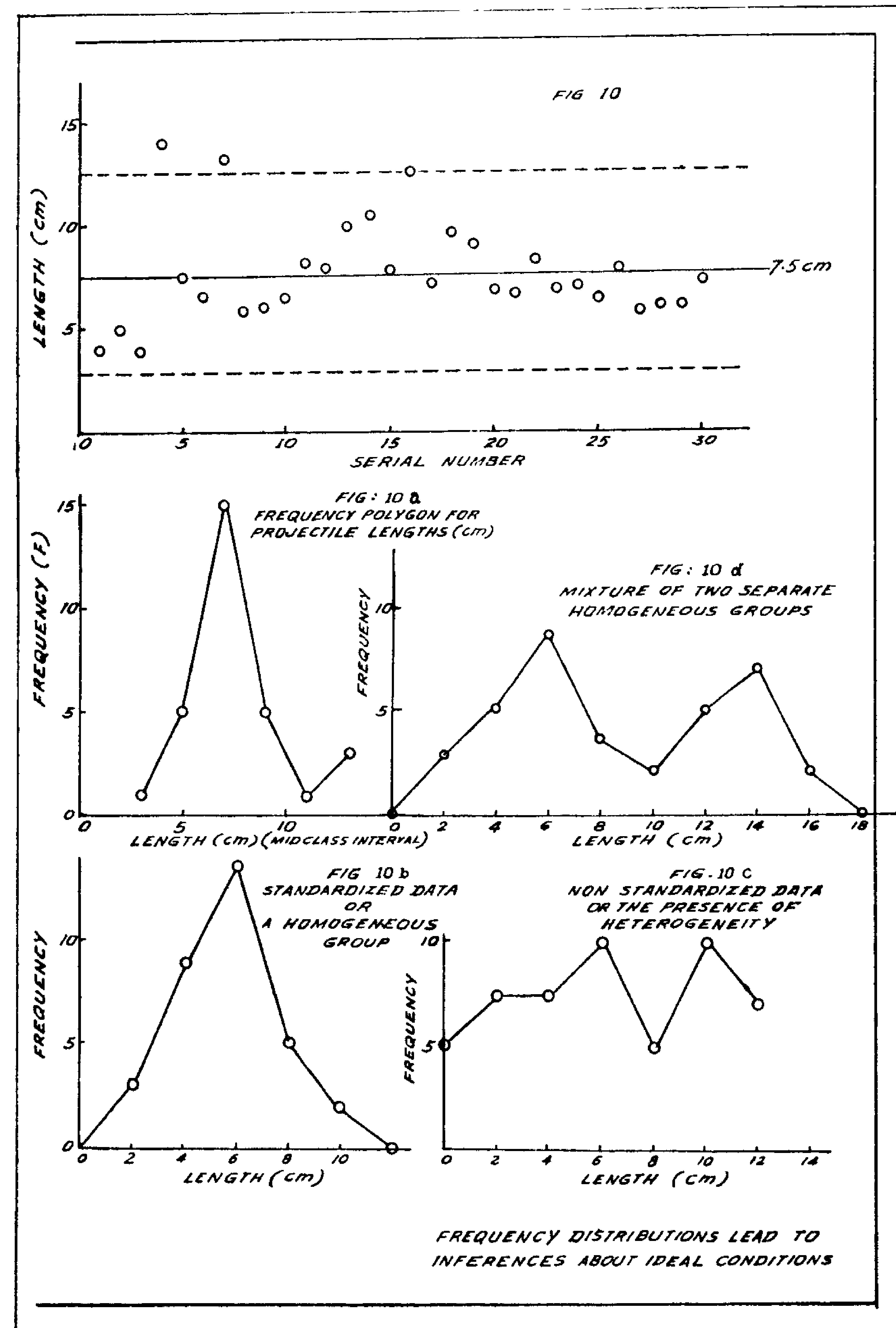

FIG 10
LENGTH (cm)
SERIAL NUMBER
7·5 cm
FIG: 10 a
FREQUENCY POLYGON FOR
PROJECTILE LENGTHS (cm)
FREQUENCY (F)
LENGTH (cm) (MIDCLASS INTERVAL)
FIG: 10 d
MIXTURE OF TWO SEPARATE
HOMOGENEOUS GROUPS
FREQUENCY
LENGTH (cm)
FIG 10 b
STANDARDIZED DATA
OR
A HOMOGENEOUS
GROUP
FREQUENCY
LENGTH (cm)
FIG. 10 C
NON STANDARDIZED DATA
OR THE PRESENCE OF
HETEROGENEITY
FREQUENCY
LENGTH (cm)
FREQUENCY DISTRIBUTIONS LEAD TO
INFERENCES ABOUT IDEAL CONDITIONS

Fig. 10

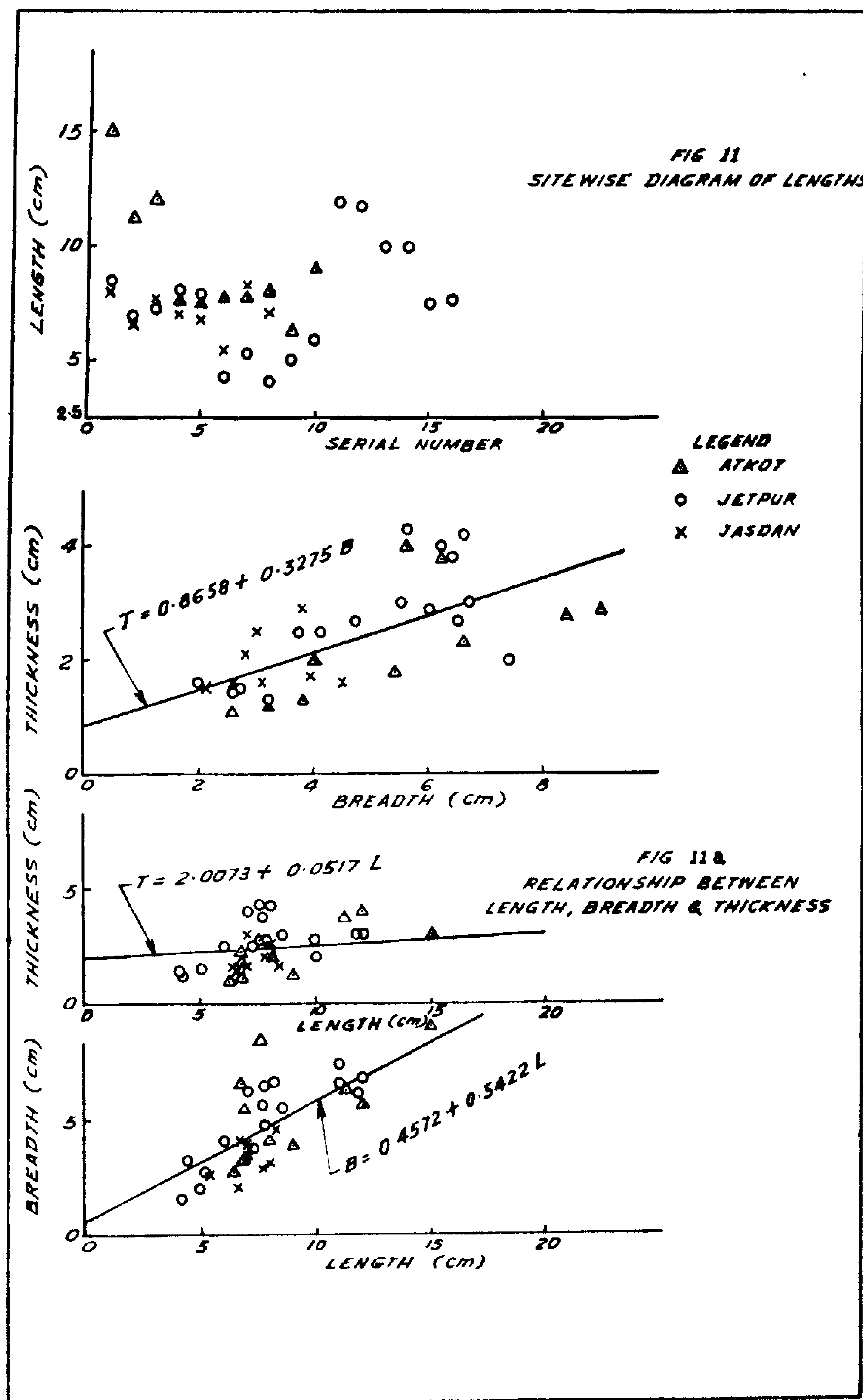

FIG 11
SITEWISE DIAGRAM OF LENGTHS
LENGTH (cm)
SERIAL NUMBER
LEGEND
ATKOT
JETPUR
JASDAN
THICKNESS (cm)
T = 0.8658 + 0.3275 B
BREADTH (cm)
FIG 11a
RELATIONSHIP BETWEEN
LENGTH, BREADTH & THICKNESS
T = 2.0073 + 0.0517 L
LENGTH (cm)
BREADTH (cm)
B = 0.4572 + 0.5422 L
LENGTH (cm)

Fig. 11

This theory known as 'Theory of Rregression' is found to be useful to explain the rising or falling tendencies or any type of systematic variation noticed in a set of values. The observations may be varying according to some phenomenon, which can be brought to notice, provided it can be measured and found to be closely associated with the character under study.

Appendix—I illustrates applications of the above procedures to numerical data. The solved examples serve to demonstrate the 'Scope' of statistics and its utility to draw suitable inferences. More refined methods can be availed in particular cases of special interest as and when the demand arises.

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APPENDIX I

EXAMPLE 1 :

Below is the data of lengths observed on 30 points (cm).

Sr. No	Length (cm)	S. No.	Length (cm)	S. No.	Length (cm)
1	4.0	11	8.2	21	6.8
2	5.0	12	7.9	22	8.2
3	4.0	13	10.0	23	6.7
4	14.0	14	10.4	24	6.9
5	7.5	15	7.7	25	6.4
6	6.6	16	12.6	26	7.7
7	13.3	17	7.1	27	5.7
8	5.9	18	9.5	28	6.0
9	6.1	19	9.0	29	6.0
10	6.5	20	6.8	30	7.2

Tabulation :

Original data in above table can be tabulated in a compact manner as under :

	0	1	2	3	4	5	6	7	8	9
0		4.0	5.0	4.0	14.0	7.5	6.6	13.3	5.9	6.1
10	6.5	8.2	7.9	10 0	10.4	7.7	12.6	7.1	9.5	9.0
20	6.8	6.8	8.2	6.7	6.9	6.4	7.7	5.7	6.0	:9.0
30	7.2									

It can be noticed that the columns for Serial Nos. 1 to 30 in detail are avoided. One foolscap sheet will accommodate about 500 observations or even more in this type of tabulation which otherwise will go to 2 to 3 sheets.

Graphical Presntation :

Above data can be appreciated well, if it is presented pictorially by plotting a graph. Fig. 10 clearly shows that most of the values are scattered around a horiozntal line at 7.5 cm. Moreover, the scatter is much wider in the initial 15 observations, which has improved much thereafter. A numerous data in the form of numbers or digits can well understood after converting it into a graph.

Compilation :

Sample data pertaining to 30 observations as above or more say upto 50 or 100 can be studied easily. But as the sample size becomes larger containing observations in multiples of hundreds or thousands a 'Frequency Distribution' presented below as for the present data, is better way to compile the data.

Length cm	Tally marks	Freque-ncy.	Mid-ledgth cm–x	Fx	Fx^2
1	2	3	4	5	6
2 – 4	I	1	3	3	9
4 – 6	𝍸	5	5	25	125
6 – 8	𝍸 𝍸 𝍸	15	7	105	735
8 10	𝍸	5	9	45	405
10 –12	I	1	11	11	121
12 –14	III	3	13	39	507
Total :		30		228	1902

$$\text{Average} = \frac{228}{30} = 7.6$$

$$(\text{Standard diviation})^2 = \frac{1902 - (228)^2\ 30}{30 - 1}$$

$$= 169\ 29 = 5.83$$

Knowing the highest (14 0) and lowest (4·0) length in the sample of observations, convenient class-intervals as in Col. (1) of the above table are presented. The observed lengths are then distributed in various classes by making a tally mark as shown in Col. (2). Col. (3) gives the frequency or the number of tools lying in the particular class interval of length. Col. (4) to (6) give the method of working the Average and the Standard Deviation from a grouped frequency distribution.

Fig. 10a plots this frequency distribution, which has a definite peak at about 7.5 cm. This indicates a homogeneous or standardized group of data evenly scattered around the ideal.

EXAMPLE 2 :

The data on the lengths of Early Stone Age Tools collected at 3 different sites on river Bhadar, Saurashtra (India) are as follows :—The tool Kit consists of Handaxe, cleaver, Scraper etc.

No.	Jetpur (cm)	No.	(cm)	Atkot No.	(cm)	Jasdan No.	(cm)
1	8·5	9	4·9	1	15·0	1	8·1
2	7·0	10	5·9	2	11·2	2	6·6
3	7·2	11	12·0	3	11·9	3	7·7
4	8·1	12	11·7	4	7·6	4	6·9
5	7·7	13	9·9	5	6·7	5	6·7
6	4·3	14	9·9	6	6·8	6	5·4
7	5·1	15	7·6	7	6·8	7	8·3
8	4·1	16	7·7	8	8·1	8	7·1
				9	6·3		
				10	9·1		

	Jasdan	Jetpur	Atkot
Mean or Average (cm)	7·1	7·5	8·9
Standard Deviation (cm)	1·12	2·30	2·80
Coefficient of variation(%)	15·8	30·7	31·5

These data when plotted in same fig. 11 show that observations at one place are not in any way different from the other. The observations plotted in different notations are all intermixed, thus indicating a homogeneous set of data.

Comparison of Variability :

On calculating the Mean and Standard Deviation for each set separately, it is seen that standard deviation for Set 1 is 1 12 which is much lower than the other two sets. This is quite evident from the figures. The question then arises 'whether for the remaining two sets the figures for std. dev. 2·3 and 2·8 can be regarded as nearly equal ?', as hey appear to be so. To answer this, we see that set 2 where std. dev. is slightly higher, has its average also at a higher level. To get the correct idea, therefore, for the comparison of the variation as given by the Standard Deviations, we work out

$$\text{Coeffcient of Variation} \quad \frac{\text{Std. devi tion}}{\text{Mean}} \times 100$$

and the figures for the 3 sets are shown in the above analysis. The coefficient of variation for set 3 is more than set 2, from which it is inferred that set 3 is more variable than set 2 and the higher std. dev. of 2·8 is a reflection of larger variability, accounting for the increased variability due to higher average.

Tests of Significance :

Statistical tests of significance have been developed examine rigorously the differences which are apparent, e.g. in the above, the means of 7·5 and 8 9 for set 1 and 2 are clearly different in quantity. But is this much difference tolerable ? The degree of tolerability depends upon the amount of variability present in the sample from observation to observation as measured by the Std. Deviation. The individual observations vary from 4 to 8 and then to 12 and in this context the difference in the two means (8·9 - 7 5) = 1 4 is to be seen, whether it is of material or significant order. For this, statistical test of significance 't-test' is

$$t = \frac{8 \cdot 9 - 7 \cdot 5}{\sqrt{(15 \times (2.3) + 9(2.8))/(16-1+10-1)}} = \frac{1.4}{\sqrt{6.1833}}$$

$$= \frac{1.4}{2.48} = 0.56$$

For the number of observations (16 + 10), this value of 't' is not significant as deduced from the tables for the distribution of 't'. The two observed means 7·5 and 8 9 can then be regarded of the same order or the two samples from which thees means are derived originate from the same population.

Correlation and Regression :

The measurements on Length (L), Breadth (B) and Thickness (T) observed on the number of tools at 3 different places are plotted in Fig. 11a as a scatter diagram. It is seen that 3 different graphs (i) L v/s. B, (ii) L v/s T and (iii) B v/s T, wherein the distinction is maintained for each site in the notation, show a close association or the related variation between the two factors. Moreover, the 3 sites at which the tools are found seem to be intermixed in each of the graph, and thus the association of similar or same order continues from site to site.

This important finding that Length, Breadth and Thickness on an implement are interrelated, leads us to work out the law of relationship. Following laws are found from the pressnt data.

Equation	Correlation coefficient
$B = 0{\cdot}4522 + 0{\cdot}5422\ L$	0·69 ... (1)
$T = 2{\cdot}0073 + 0{\cdot}0517\ L$	0·13 ... (2)
$T = 0{\cdot}8658 + 0{\cdot}3275\ B$	0·64 ... (3)

Thus knowing the Length we can work out Breadth from equation (1) or Thickness from Breadth by equation (3). The 'correlation coefficient' is the criterion for assessing the usefulness of the equations. A value of 'one' will be obtained for correlation coefficient (r) in the most perfect case, where all the observations lie exactly on the line fitted. A value of 'r' of the order 0·13 as from equation (2) indicates non-usefulness of this equation for predicting purposes.

HARAPPAN FORTIFICATIONS : A STUDY

M. S. MATE

WHEELER'S DISCOVERY of fortifications around a mound at Harappa imparted a new dimension to the investigations of the Indus Culture (WHEELER 1947, 58-130). In the days past, a few scholars had indeed suspected the existence of fort walls in the ruins of the Indus sites, more especially at Mohenjodaro, but widespread excavations at various places in the nineteen thirties had failed to prove that such really was the case. In due course, this failure to find any fortifications came to be termed 'absence of fortifications' and this conversion had in its turn a rather curious upshot. It came to be treated as a 'differentia' of the Indus 'Social Order'. The Harappan society with its unwalled towns marked a sharp contrast to contemporary Egyptian and Sumerian societies with their towering fortresses and citadels housing kings and priests. It came to be considered as a wealthy mercantile community that had in some unscrutable manner done away with aristocratic or princely rule symbolised by citadels and forts; and further that it had established a democracy based on 'bourgeoisie economy'. In 1946 Harappa yielded a citadel, a conventional 'seat' of the power of a 'few'. It adhered to an almost classic pattern. No longer was it possible — or so was it thought — to project into the distant and dim past fond theories and concepts of democracy and economy. It was only a matter of time before the sprawling mounds of Mohenjodaro were made to yield their secret. Mohenjodaro revealed an identical pattern, of a town and its guardian citadel, the latter heavily fortified. Since then, Sutkagen-Dor, Sotka-Koh in Baluchistan, Ali Murad in Sind, Desalpur in Kutch, Lothal in Gujarat and Kalibangan in Rajasthan have yielded traces of fortifications. One site, Kot Diji in Pakistan has preserved a pre-Harappan wall around it. A few other places of the Harappan culture are also known to have presrved ruins of town walls but as WHEELER (1947, 62) says, they were mostly 'police measures' and further that, "village fortification is a normal principle of self-help in the East and has no wider implication."

These ruins of fortifications are certainly interesting in themselves. They also have a great bearing on some other and perhaps more significant aspects of the Indus culture. As the earliest known (in India) concrete manifestations of military engineering their value is great. Then, their strength or weakness would enable one to guess the nature of the dangers they were

expected to meet. Their distribution is likely to throw a good deal of light on the overall strategic situation as then obtaining as well as on the core and the extent of the political power governing the Harappans. And in the ultimate analysis it may assist us in a better understanding of the rise and expansion of the Indus Culture--if not the causes, the process at least. Except a rather hypothetical suggestion made by WHEELER (1953, 52-56), little has been said on the military aspect of this civilization. A comprehensive examination of the evidence in that regard is, therefore, undertaken here.

No continuous line can at present be drawn on a map to indicate the expanse of the Civilization, but a fairly good idea of it can be obtained from the locations of the various sites so far known. Alamgirpur, some 43 km to the North--East of Delhi marks the easternmost limit. Although some sites further eastwards are reported to have yielded pottery similar to the Harappan, the evidence is too sketchy to permit of any definite statement (ARMM, I, 63). Sutkagen-Dor on the Makran coast of Pakistan is the western limit. Rupar in Punjab (India) is the most northerly site yet discovered whereas in the south it is Bhagatrav in Gujarat. If these points are joined, a rough parallelogram encolsing approximately the same area as that of West Pakistan is obtained. (Figure 12).

This vast region forms a more or less homogeneous geographical unit. Its extreme westerly and southerly expansion is mainly on the coast-line and follows a logic of economic necessity well in keeping with the realities of physical geography. The nucleus was of course the Indus Valley proper along with areas watered by her tributories like the Ravi and the Sutlej. The Ghaggar or ancient Saraswati, if it was connected with the Sutlej in the distant past would form a directly contagious region; if not connected with Sutlej, it would continue to be so although less directly. The two valleys, that of the Indus and the Saraswati, have no physical barriers dividing them and are complementary to each other. The extreme limits of this area are, however, clearly defined by physical features like the Himalayan and subsidiary ranges on the west, north-west, north and north-east; the Arabian sea to the south and the Great Indian Desert or the Aravallis on the east. The basic precondition of any political unit, viz., a more or less secluded but internally united and homogeneous region thus exists here.

Within this area, more than a hundred villages and 'stations' of the Harappans along with at least seven townships have been so far located and investigated more or less thoroughly. If as the Allchins (1968, 130) suggest, Sandhanwala, Judeirjo-daro and Dabar Kot (all in Pakistan), turn out to be major townships the number would be ten. Of this total number of habitations at least nine are known to be encircled by town-walls. An important difference has to be pointed out here itself. Whereas at Desalpur, Lothal

and Kalibangan the entire townships as also the citadels have been protected with ramparts; in other cases it is only the citadel area that is so enclosed. Thus at the latter set of sites there are two distant entities, the smaller one, (citadel), well defended whereas the bigger (township) inhabited by the general public is left undefended.

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As the place where ruins of large scale fortifications were first found Harappa needs be referred to in the beginning. The citadel at Harappa is roughly a parallelogram measuring 450 m × 210 m. It is between nine to twelve metres higher than the level of the surrounding plains. The defences rest on pre-Harappan deposits which show signs of having been subjected to heavy flooding. These inroads of water were first filled up with mud-bricks and the whole was then raised to a higher level with baked bricks. This served as an anti-flood bund, spreading protectively beyond the outer foot of a great defensive wall some 14 m. wide at the base and tapering upwards (WHEELER. 1947, 19-20). The core of the wall was of mud-brick but it had burnt-brick revetment 1.20 m. to 1.80 m. thick, externally. A sort of buttress was added internally, as an afterthought, in the form of a sloping platform of mud-brick. Bastions were built at fairly regular intervals and some of them at least were taller than the circuit wall. The main entrance was on the northern side. Evidence of guardrooms flanking the subsidiary gateways in the Western wall was clear. At the southern end a broad ramp or stair led up to the citadel.

Three phases or reconstuction have been identified by the excavator. Of these, a few points are of interest for the present discussion. Of the first or original phase, the excavator states, 'as originally built the defences of the citadel long remained untouched save by the weather, which wore and rounded the exposed surface of the baked brick revetment to a notable extent' (WHEELER, 1953, 20). The final phase or rejuvenation consisted of an enlargement of the defences on the north-west corner and the blocking off of the gateway in the northern wall.

The structures enclosed within this wall were erected on a raised platform but it has not been possible to say anything precise about their nature. And we are left to infer some of the vanished features from the analogy of Mohenjodaro.

This last site was dug next in search of fortifications, and had a citadel located to the west of the township. It was raised on an artificial mound as at Harappa. The general height of the former being 6.5 m to 13 m. It is

clear that from early times the artificially raised platforms at Mohenjodaro had to be protected from the floods and for this purpose a mud-brick embankment of 14 m. width was first constructed. The defences of this place have not been so fully explored as those of Harappa, but whatever work has been done is enough to give a good idea of how the things looked like. The extent of the citadel mound here was the same as that of Harappa. This was surrounded by a baked-brick wall and massive towers. Out of these, the earliest had to be protected from the floods and for this purpose a mud-brick embank-created by the deteriorated timber filled up with burnt-brick. 'The gradual multiplication of rectangular bastions at the south-eastern corner cannot be fully explained without further excavation. Two of them seem to have originally flanked a postern gate, which was later blocked and replaced by a platform with a parapet'. About the location of the main entrance nothing has been said or suggested. But is is made clear that the defences were of a less simple and uniform kind than is suggested by the equivalent system at Harappa. (Wheeler, 1953, 28-29).

If the details available about the defences of the citadel at this place are less satisfactory than those of Harappa the evidence here as to their contents is extremely instructive. Within the enclosed area were uncovered 'the Great Bath' and a large building (75 m. × 25 m.) which might have been the residence of some high official, perhaps the chief priest or king. A huge granary was just on its fringes. It has been inferred from the nature of these structures that this citadel was 'both a religious and a secular headquarters' (Wheeler, 1960, 244).

Sutkagen-Dor on the western extremity of Baluchistan has been explored twice, first by STEIN and then by DALES. Their observations do not differ much except in a few details and the more important contribution of Dales is his interpretation of the locus of this site on the estuary of the river Dasht. Standing on two separate sandstone ridges was the usual pair of a township and a citadel. The latter was a parallelogram of 206 m. × 103 m. The stone wall built of huge blocks, was 11 m wide at the base according to Stein and had a buttress of mud-brick wall 2.50 m in thickness. It tapered upwards and had a gate at the western end of the southern side, flanked by massive rectangular towers. Sotka-Koh was identical to this one in all respects, even in its location on the mouth of a river. (STEIN, 1931, 60 and DALES, 1962, 86-92).

Ali Murad, some 32 km south-west of Dadu in Sind was also fortified. The mound of about 8 m height was surrounded by a stone defensive wall enclosing an irregular squarish area, about 240 m each way. The walls were built of roughly dressed stone and were about 1.40 m in width. The entrance probably lay on the southern side (Majumdar, 1934, 89).

Desalpur in Kutch shows traces of a stone fortification wall some 4 m in basal width and 2.50 m in extant height. It has been reinforced by corner salients and towers externally built of stone but having a mud-brick filling within this stone shell. Huge blocks of stone sometimes 3 m × 1 m have been used in its construction. No specific gateway has yet been discovered (*IAR*, 1963-64, 17).

Kalibangan in Rajasthan has, as already mentioned, two separate mounds, the citadel and the lower city. Of these the former is on the western side and measures roughly 150 m E–W and 250 m N–S. Here, the lower city or township has also got a town-wall. Its width varies between 3 m to 3.90 m, the maximum available number of courses of mud-brick being fifteen. In the northern part at least, the city wall had been built in 'box pattern', with bricks on the outer side and a mud filling inside (*IAR*, 1967-68, 43-44). Three possible gateways have also been located and these were probably flanked by guardrooms. The citadel at Kalibangan holds unusual interest as it has preserved fortifications of two periods, Harappan and pre-Harappan. Its size is mentioned above. The wall was initially 1.90 m thick but was increased in width during the pre-Harappan phase itself to 3.70 m to 4.10 m. It was strengthened by rectangular bastions and had well-guarded entrances. The Harappans superimposed their fortifications on this but occupied only half of the area, that on the south. In the construction of this also mud-brick was used and massive towers stood sentinal over the corners. The main gate again perhaps flanked by a bastion, lay in the southern side.

Lothal on the Gulf of Cambay has a number of novel features. First there is the huge dock, with its carefully planned and executed arrangements for flooding and draining. Next comes the neat town-plan with regular mud-brick platforms. And finally the mud-brick rampart some 4.50 m in width and 2.30 m of available height. The whole city was rectangular on plan. And although is was enclosed by a rampart mainly as a precaution against floods, the appearance of a smaller enclosed area within these walls is of great interest. It has been rightly identified by the excavator as the citadel. (Rao, 1962, 14-30).

Kot Diji in Sind has preserved a pre-Harappan fortification which was not utilised or rebuilt by the Harappans. Harappan residential structures were built over it. (KHAN, 1958). As such for the present discussion it is of little direct consequence except for a single fact. The residential buildings were set very close to the wall, in fact the defence wall often served as the back wall of these houses. This pattern at Kot Diji is of common occurrence at a number of Anatolian and West Asian sites of the same date (Clarke and Piggot, 1965, 203-07). How it had arrived here is something difficult to explain, but it is just likely that if this pattern is kept in mind the buildings

within the citadels of more Harappan sites would make greater sense than they do today.

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An aspect most intimately connected with this problem is the nature and quantity of the weapons of the Harappans. Due allowance has to be made for the possibility that weapons in metal might have been lost in antiquity itself. So also a few of the things that have been discovered might not have been interpreted properly. These qualifications, however, apply to almost all the types of antiquities discovered from any excavated site and conclusions based on them would be subject to revision in this as in other fields.

Authorities who have written on this point have been one in agreeing that the large number of flakes and blades of stone found in the Harappan sites do not belong to the class of 'arms and weapons' (WHEELER, 1953,52-56) and MACKAY, 1935, 125-127). Other notable items that are absent from the remains are shields, helmets or mails of metal. If there existed any substitutes for them in other materials like wood or leather, no direct evidence exists. Whatever arms and weapons have been found are made of copper or bronze with a poor tin content. There are short swords, knives or daggers, axes, spearheads and arrowheads. Swords are short measureing about 50 cm and have broad blades. Spearheads and knives are easily confused and both have such thin blades that they would warp on impact with any hard material. Arrowheads are fairly numerous, are leaf-shaped, have long tangs but do not have any mid-rib, a split bamboo or wooden handle probably serving the purpose as in the case of spears. A type of barbed arrowhead occurs rather infrequently. Axes were hafted with tongs, no sockets or socket holes are found. Fish-hook and other fishing gear have been uncovered in large quantities.

Mace-heads of alabaster, sand-stone, cherty limestone and a hard green coloured stone resembling slate have been of common occurrence. A mace—head of bronze or copper has also been reported from the Late Harappan levels of Chanhudaro. One has, however, to remember that these might as well be weights for digging sticks.

Baked clay pellets of various sizes and of oblong and round shapes have been found. These might be missiles hurled with the hand or with a sling.

Commenting on the nature of the arms found in the Harappan sites Mackay states, "It cannot be assumed that these (axes) were used in war, as there is no evidence that their inhabitants were ever seriously threatened by outside enemies until the last phases of the existence of the Indus cities; but they

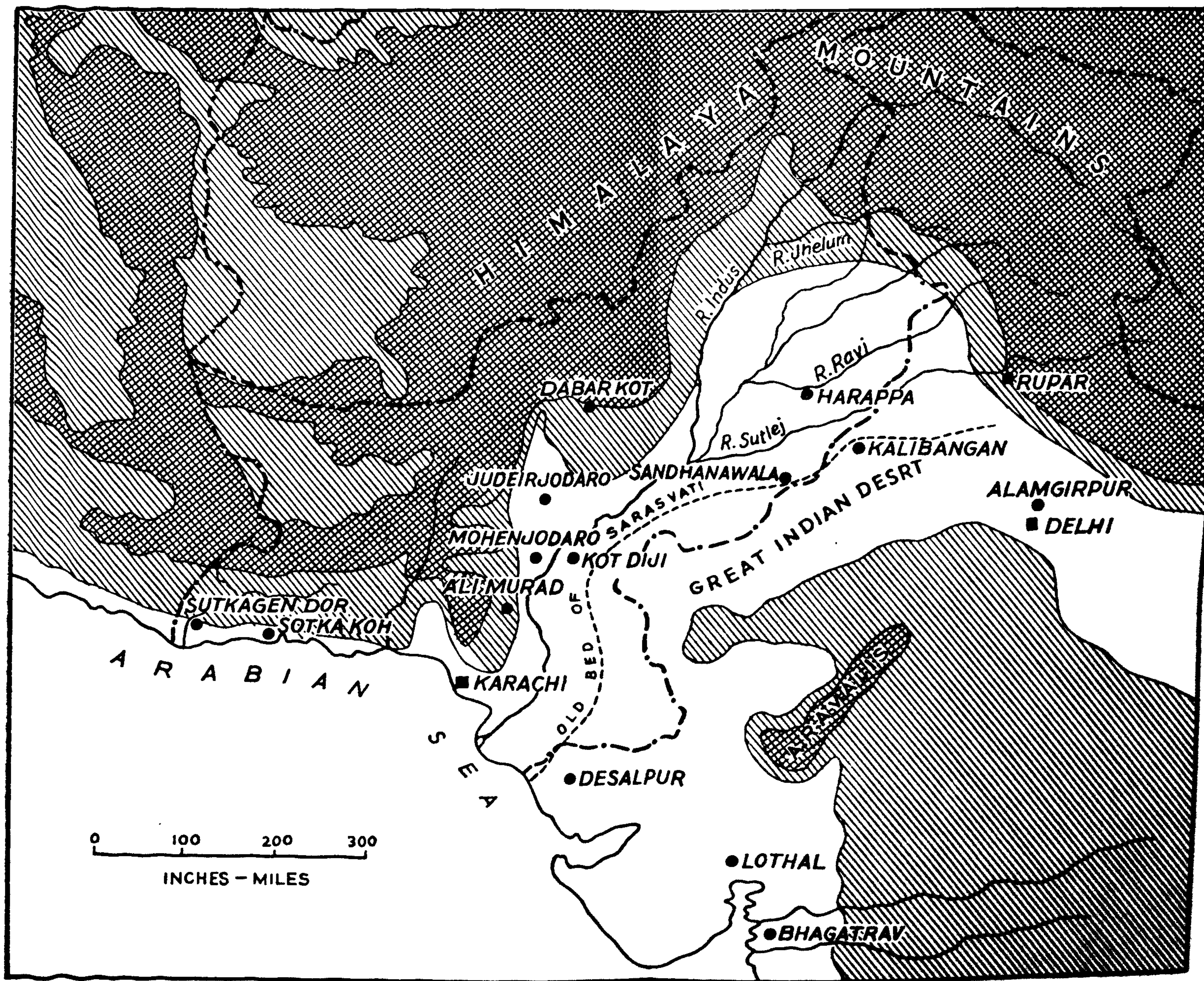

HIMALAYA MOUNTAINS
R. Indus
R. Jhelum
R. Ravi
R. Sutlej
DABAR KOT
HARAPPA
RUPAR
KALIBANGAN
SANDHANAWALA
JUDEIRJODARO
SARASVATI
GREAT INDIAN DESRT
ALAMGIRPUR
DELHI
MOHENJODARO
KOT DIJI
ALI MURAD
OLD BED OF
SUTKAGEN DOR
SOTKA KOH
ARABIAN SEA
KARACHI
ARAVALLIS
DESALPUR
LOTHAL
BHAGATRAV
0 100 200 300
INCHES — MILES

Fig. 12

could have been used in working wood, in the chase, and perhaps against dacoits, like the little battle-axe so often carried by the countryman of Upper Sind." (MACKAY, 1935, 124). Writing full twenty years after Mackay and after the discovery of fortifications around Harappa and Mohenjodaro, Wheeler seems to be equally cautious. "But alongside these are found metal implements of which a majority may have been used equally by the soldier, the huntsman, the craftsman or even the ordinary house-holder and are included in this section without prejudice...... It may be repeated that many of the implements mentioned in the previous section are manifestly of an unspecialised kind just as likely to have been used for hunting or other unmilitary purposes as for war." And further, "True, the military element does not loom large amongst the extant remains," but he hastens to add "but it must be remembered that at present we know almost nothing of the earliest phase of the civilization." (WHEELER, 1953, 52-56). It is quite clear that as compared to other contemporary societies the armoury of the Harappans is most unimpressive.

A detailed discussion of the Harappan fortifications can now be undertaken with a view to find out the general principles and practices that governed their location and erection. To begin with, they fall in two classes as far as size is concerned, one larger as at Mohenjodaro and the other smaller as at Sutkagen Dor. The size of each group is practically standard. As to shapes, they are either rectangular or are parallelogramatic. This uniformity in size and shape is quite revealing. It shows that internal arrangements were predetermined. What structures were to be located was fixed. Their plans were traditional. The methods of construction and the layout of these structures generally determine the overall plan of the fort or town-wail. Since the plans and sizes are uniform, the internal layout can also be treated to have been standard. These internal factors governed the layout, it had no reference to the contours of the ground, the latter was not thought of in the context at all. The selection of the site was governed by considerations such as easy access to land or water routes rather than the needs of defence. Natural inaccessibility was not a consideration. Secondly the materials used were those locally available. Mud-brick formed the mainstay; baked-brick revetments were added at the two principal sites of Harappa and Mohenjodaro. Stone was utilised only in the hilly regions as at Sutkagen Dor or Desalpur. No selective preferences are indicated. The walls of mud-brick and mud had an average thickness of 3.50 m to 4 m and the height could have been as much as thrice the width; in one case at least the extant height was twice as much, indicating that it could originally be more, perhaps thrice. These walls tapered upwards from either side. Their thickness and height would make them fairly invulnerable. Bastions and towers along the walls were generally taller than the circuit walls and must have served as observation posts as well as points from which missiles could be hurled — as at Mohenjodaro where a large number of clay pellets were found on one of the bastions. The entrances

were guarded by flanking towers but other than that no complexities seem to have been introduced that would baffle, harass and prevent forced entry. No ditches or moats are uncovered at any of the sites. Very little is known about arrangements for water-supply within the enclosed areas and as such it is difficult to say whether they were expected to withstand any seiges.

In general, it could be said that the ramparts made access to the citadel extremely difficult though not entirely impossible. No advantage of the terrain was taken to add to their effectiveness and their location was governed by non-military or civil considerations.

This emphasis becomes more pointed when the nature of the buildings within the citadels is taken into consideration. There were the residences of the God, of the Priest and the King. Of equal importance were the store houses or granaries which might represent the town's wealth. This grain might actually represent, as in ancient Egypt, the taxes paid by the cultivators to the government, whether priestly, princely or aristocratic. Following the same analogy, these places might represent well protected government headquarters either central or provincial. The protection might be from local population which in a crisis might wreck its wrath and displeasure on the rulers and their treasury. In times of famine these treasuries would become the first target of the destitute and it was ordinary common sense to protect them; that is how the citadels grew up in West Asia. To use another expression it could be a normal police measure aimed at internal security.

Lack of evidence of destruction by the human agency either of the fortifications or of the towns except in the Last Phase of the Harappan culture shows that they fulfilled most successfully this role viz internal security. It would also mean that they were free from the threat of external danger of any magnitude. When the Harappans finally did face a really determined foe their fortifications were of no avail as can be deduced from the ruins indicative of purposeful destruction in the case of many sites. It would not mean that there were no intruders. Such a situation is unlikely in the extreme. The most probable thing is that like their successors in the heartland of the continent two thousand years hence, the Harappans too relied on battles in the open field. A standing army of able fighters would clash with any invaders and stop and destroy them. It can as well be stated that no need for structural defences was felt unless we take it that the boundaries of the state were not far removed from the citadels. Such an assumption would be valid only for the initial stages of the growth of this civilization but not for the more advanced one. On no frontiers of the empire as described above, have yet been found ruins of forts and fortifications. And their absence seems to indicate that they never formed an integral part of Harappan defence system.

A fort could play another role also. It would enable a band of soldiers to spread out in a given area and to establish on a firm footing the new rule there, in the newly conquered lands. It could also be an effective springboard from which fresh aggressions could be launched. This two-fold use means that forts could be excellent instruments of aggression. From a long term point of view, such forts have to be treated as mobile instruments of offence. Quite obviously a fort cannot be bodily lifted from time to time, only the garrison can be shifted from place to place. The frequency of these shiftings would never be as much as of army units but would be governed by the fluctuations in the frontiers of the land. Such use of forts, use for offensive purposes was common in contemporary Egypt (POSENER, 1959, 94-95) and Sumer (SAGGS, 1962, 39). Such military stations and forts are nowhere found in the Harappan remains. This again would indicate that either the Harappans did not use military force in the expansion of their realm or they used mobile field forces instead of forts to attain the same objective. Both seem to be partially true. This also fits in with the defence pattern indicated earlier.

To sum up, the so called fortifications of the Harappans were local security measures, forts and fortifications did not play any role in the Indus Valley polity and in the Indus military system. In its turn the military element in the Indus culture is not as conspicuous as descriptions of a few citadels would make it out to be. The unity of the civilization was based on something much deeper than forcible conquest and military might. If and when it was used it was merely as a complement to the basic unity arising out of economic interrelationship which in its turn had its roots in geographical homogenity. This was no eastern edition of Sumer or Egypt.

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EVIDENCE FOR A NEW CHALCOLITHIC CULTURE IN SOUTH RAJASTHAN

V. N. MISRA

THE EXISTENCE of a chalcolithic culture in south Rajasthan as revealed by the excavations at Ahar[1] and Gilund[2] is by now well known. Nearly fifty sites of this culture discovered so far show that the culture was centred in the valleys of the rivers Berach and Banas in Udaipur and Chitorgarh districts, though its outliers extend eastward into the districts ot Bhilwara, Ajmer and Tonk along the courses of the Banas and its tributaries.[3] The evidence from Ahar, supplemented in some measure by that from Gilund, gives a fairly clear picture of the Ahar culture.

Recent excavations at Bagor in the same geographical region have, however, brought to light another chalcolithic culture which, as we shall see below, is considerably older than the Ahar culture and belongs to an entirely different tradition.

The site of Bagor is located on a prominent sand dune on the left bank of the river Kothari, a tributary of the river Banas, some twenty-five kilometres west of the town of Bhilwara (and headquarters of the district of the same name). It has been under excavation for three seasons (1968-1970) under the joint auspices of the Department of Archaeology, University of Poona and the Department of Archaeology, Rajasthan. The habitation deposit is of the order of 1.75 m., and can be divided broadly into three cultural phases, namely, (1) mesolithic or late stone age, (2) chalcolithic, and (3) iron age. The entire deposition, however, belongs to an uninterrupted, continuous occupation evolving through time, and it is, for this reason, not possible to pinpoint clear dividing lines between preceding and succeeding periods. For this reason, it has been thought proper to refer to the three cultural manifestations as phases rather than as periods. To understand the chalcolithic culture it is therefore essential to give a brief description of the antecedent culture.

The earliest settlers were purely hunters and food-gatherers. A study of the animal bone material from the initial dig of 1967 shows that the people hunted wild cattle, the hog dear, the spotted dear, the *barasingha*, the Indian wild boar, the Indian jackal, the river turtle and the monitor lizard. They lived on compact stone-paved floors made from schist slabs quarried from the rocks

nearby and river pebbles. Circular stone alignments with a diameter of 3 to 5 metres probably represent outlines of huts which were lined on their periphery with stones to protect them from wind. The surfaces of these floors and the interiors of hut circles are littered with broken and charred animal bones, often in association with stone hammers that bear tell-tale marks of use. The technology of early Bagoreans was based on a profuse and highly evolved microlithic industry. Based on chert and quartz, the main tool types of the industry are blunted back blades, obliquely blunted or pen-knife blades, triangles, mostly scalene, trapezes, lunates and points. Typologically the industry is thus essentially of geometric type and geared to a hunting economy. A single human burial found in this phase was within the settlement — a practice that continued till the end of habitation at the site. It belonged to an adult and was laid in an extended position in northwest-southeast direction. Stone beads were occasionally used for ornaments in this phase.

It is out of this cultural background that the chalcolithic culture of Phase II developed with the introducion of certain new elements. These new elements are : an incipient agriculture, pottery, metal tools, profusion of ornaments, and a change in the burial practice. Though hunting and food-gathering no doubt continued to be the major source of food in Phase II, there is a variety of archaeological evidence to suggest that at least a limited degree of food production, whether based on farming alone or farming and stock-raising both, had come into practice. To begin with, the microlithic industry shows a progressive numerical decline suggesting reduced role for hunting. Secondly, there is a corresponding decline in the incidence of animal bone material pointing to a similar inference. Thirdly, the emergence of pottery, copper tools, increased use of ornaments of stone and bone, a single terracotta spindle whorl and richly furnished graves all point to an increasing prosperity and stability of the settlement, implying in turn a more secure basis of food supply. Fourthly, perforated stones, (Pl. VIIIa) interpreted often in the archaeological literature as weights of digging sticks, a few stone saddle querns and rubbers all suggest preparation of plant food.

The microlithic industry is essentially of the same type as in Phase I, but it is meagre in quantity. (Pl. VII). A notable feature of the industry, also seen in Phase I, is the complete absence of the crested guiding ridge technique, so conspicuous a feature of the blade and microlithic industries of all chalcolithic cultures in India.

Metal tools from this level include three arrowheads (Fig. 16, 1-3), one fragment of a spearhead (Fig. 15a, 2) and an awl (Fig. 15a) besides small shapeless fragments. The spear-head has a distinct mid-rib on both faces. The arrowheads will be commented upon a little later. All these objects are of copper and they were found in association with two burials.

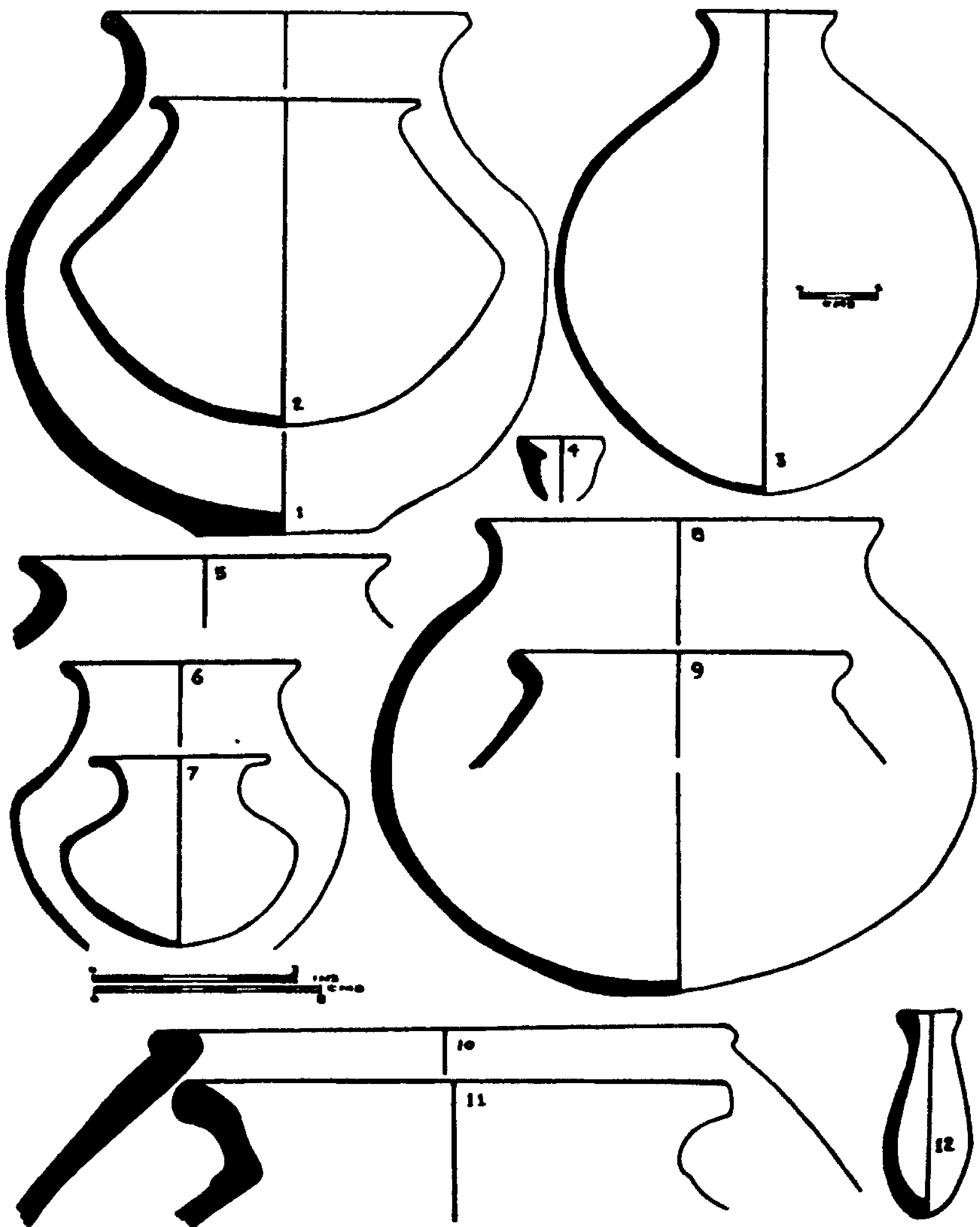


Fig 13

Pottery (Figs. 13-14) of this phase is largely handmade. Of gritty fabric, it is ill-fired and highly fragile. The pots bear a slip of varying thickness on one or both faces. Though now the surface of the colour is dull brown, from surviving patches on many sherds it appears originally to have been bright red which subsequently faded away. However, there are some vessels which are made of well-levigated clay, are well-fired and are quite sturdy. Pottery forms include a large, narrow-mouthed globular jar, short, wide-mouthed jar,

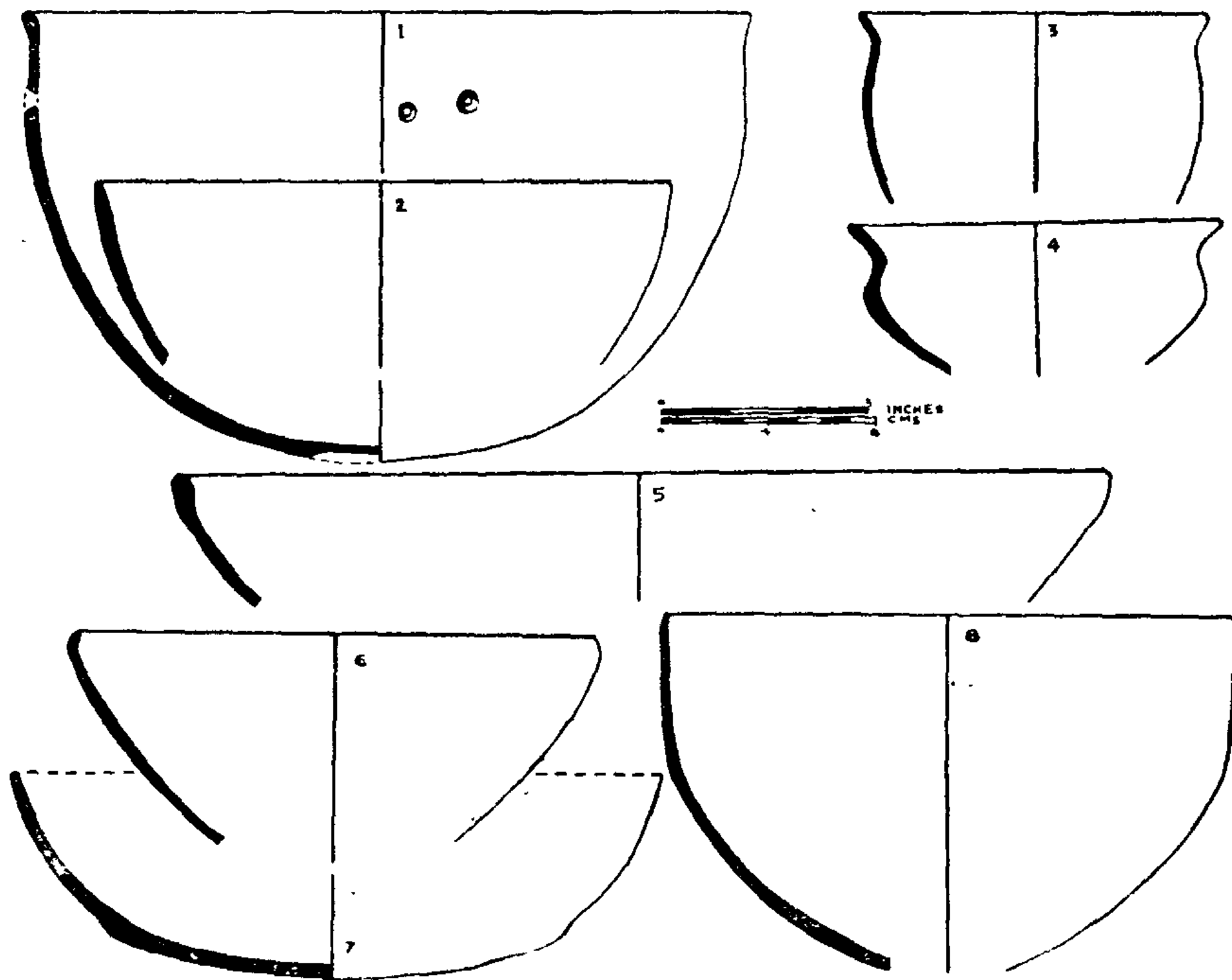
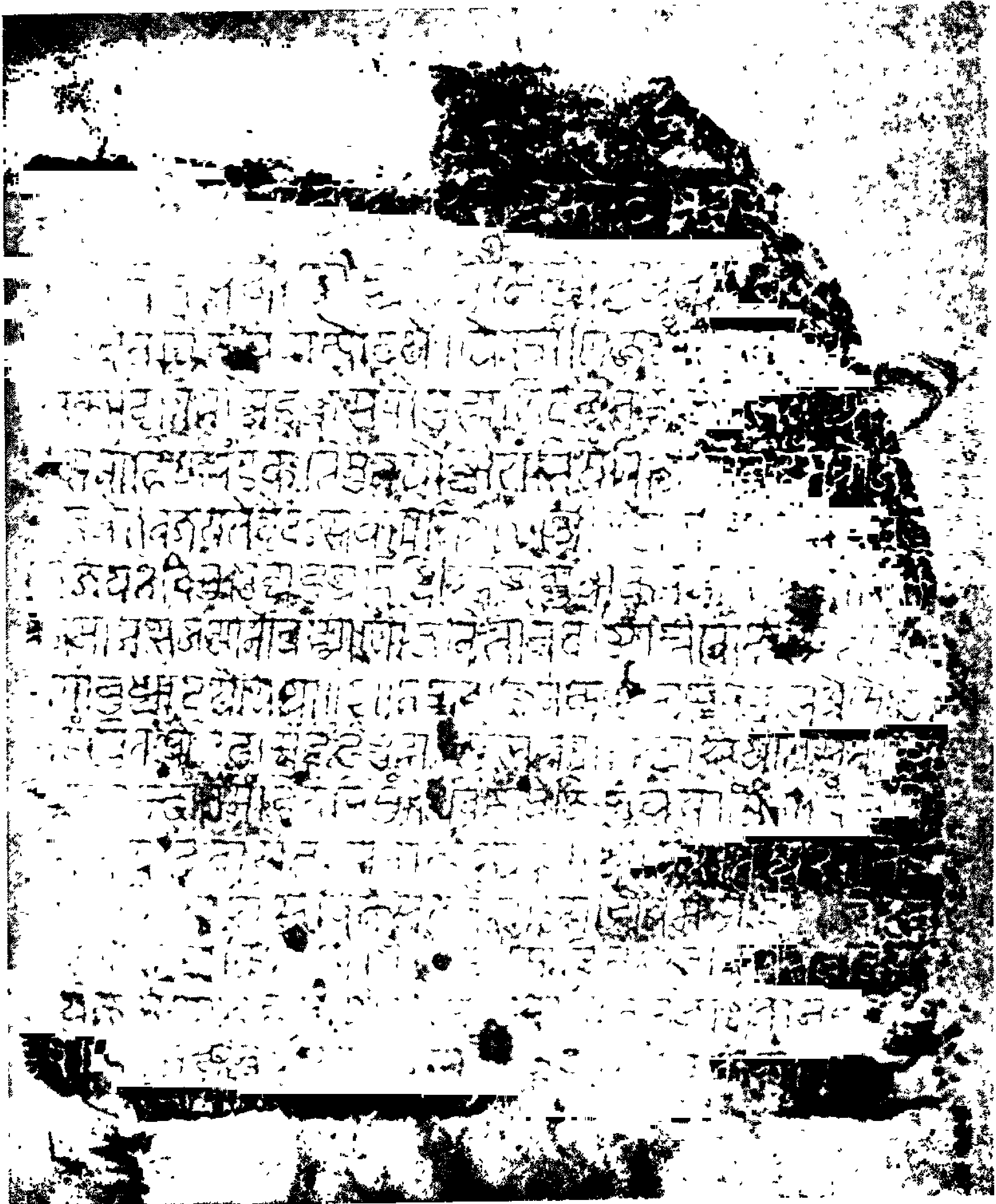


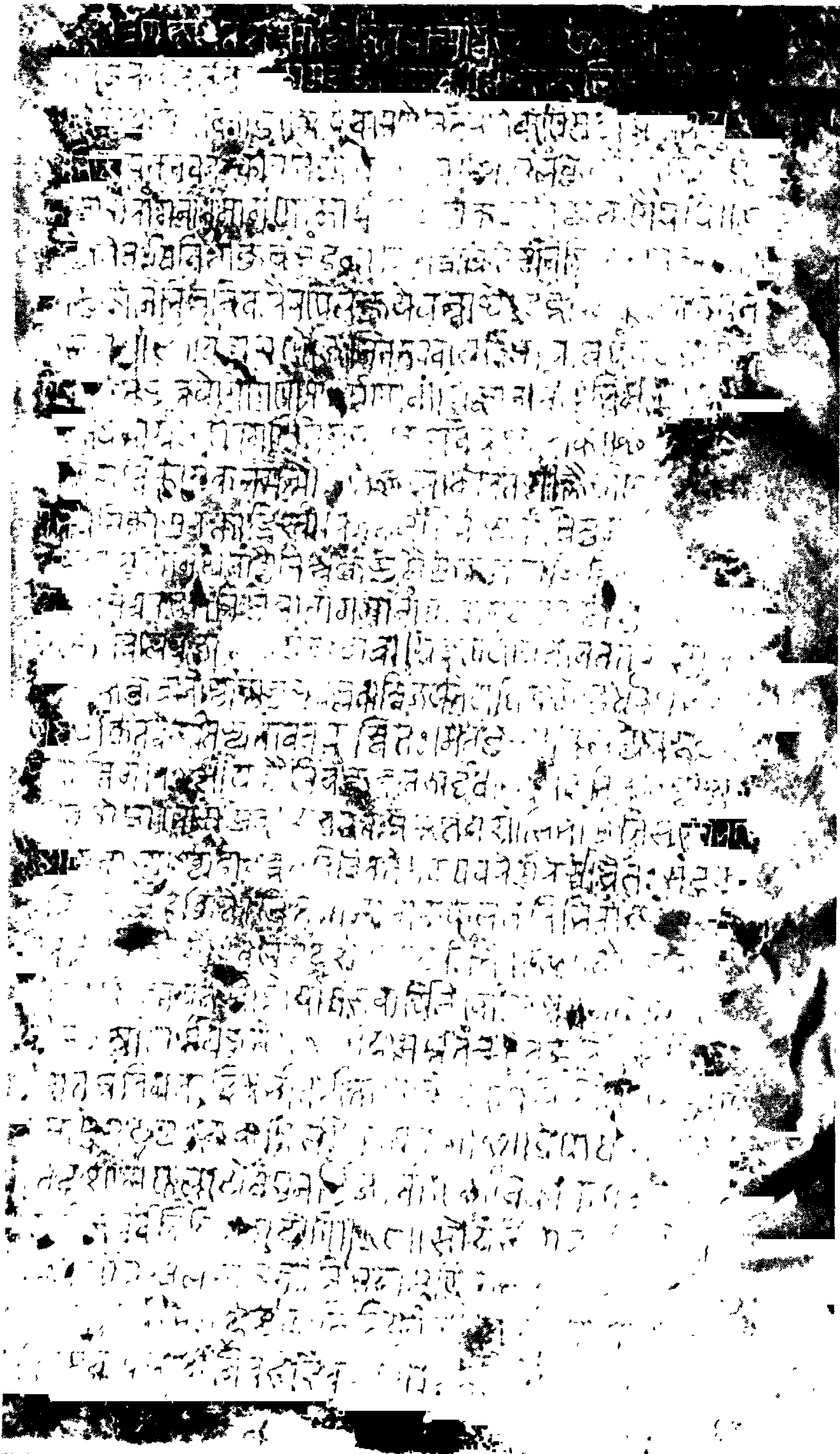
Fig. 14

large, deep bowl or basin, small bowl, large shallow pan, medium-sized pear-shaped and globular pots, *loṭā-like* vessels of different sizes, and a miniature bottle-like pot and an equally miniature bowl which could have served as a lid for the bottle. None of the pottery is painted, but some of it bears incised decoration of wavy lines, zigzags, chevrons and herring-bone patterns. In fabric. firing, shapes and decoration the chalcolithic pottery of Bagor is largely distinct from that of Ahar as well as other chalcolithic cultures. But some similarities can be seen with the chalcolithic cultures of the Banas and Chambal basins. The large, shallow pans are similar to those of the Ahar and Kayatha cultures. In particular the incised wavy line decoration on these pans is identical to that seen at Kayatha. Similarly, the thick-walled, broad-mouthed globular jar with beeded rim (Fig. 13, 10) is practically indistinguishable from a jar at Kayatha. These parallels are, however, too few and generalized to permit close correlation between Bagor and Kayatha cultures.

Structures consist as before of stone-paved floors and circular hut outlines. Ornaments comprise numerous stone and bone beads of disc, or globular or tubular shape. A complete necklace of thirty-five beads was found in *situ* in a burial. Pieces of red and yellow ochre found all through the habitation would seem, in the absence of any painted materials, to have been used for the decora-



Pl. V : Stone inscription from Pandharpur



Pl. VI : Stone inscription from Pandharpur

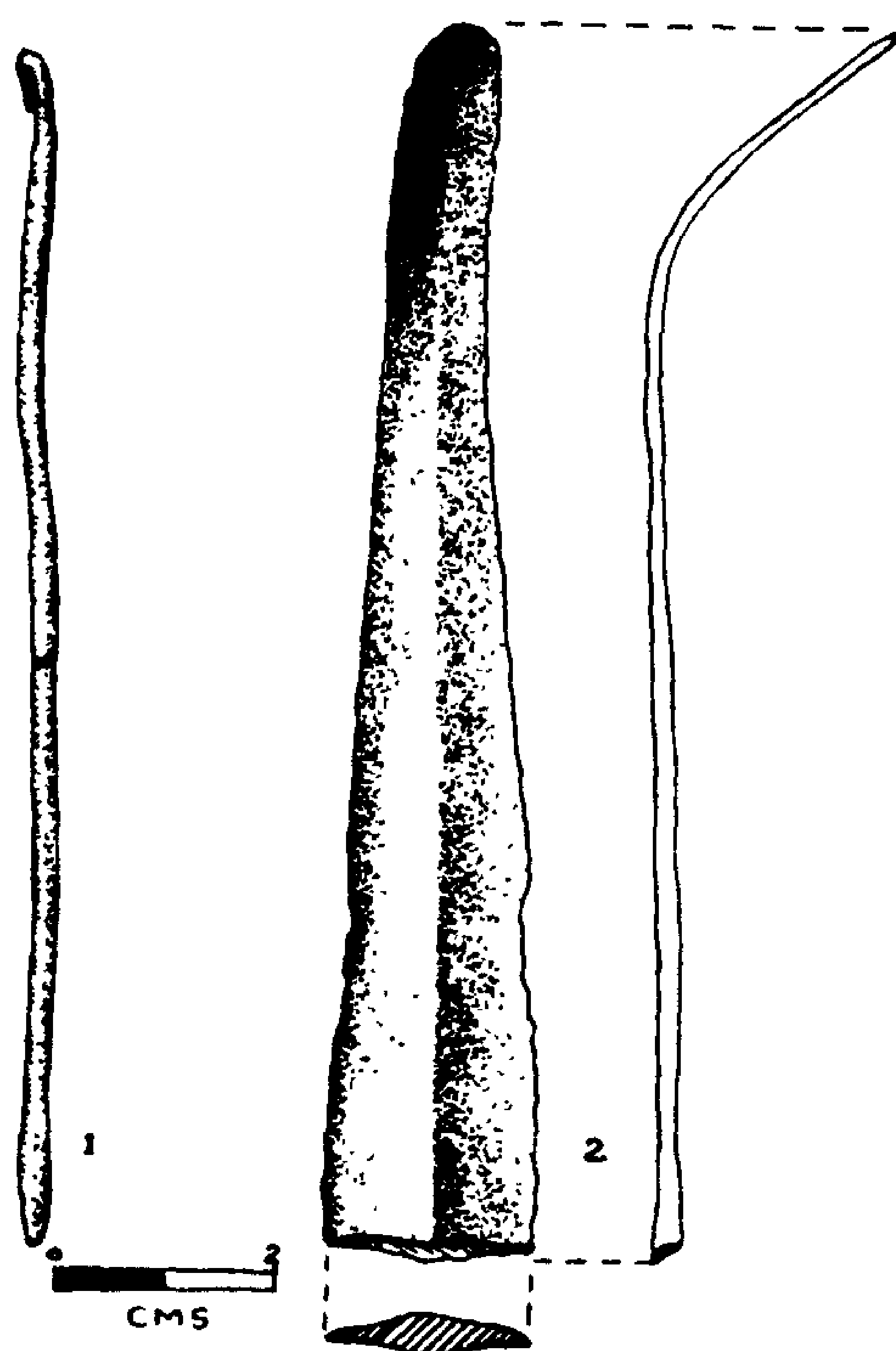


Fig. 15a

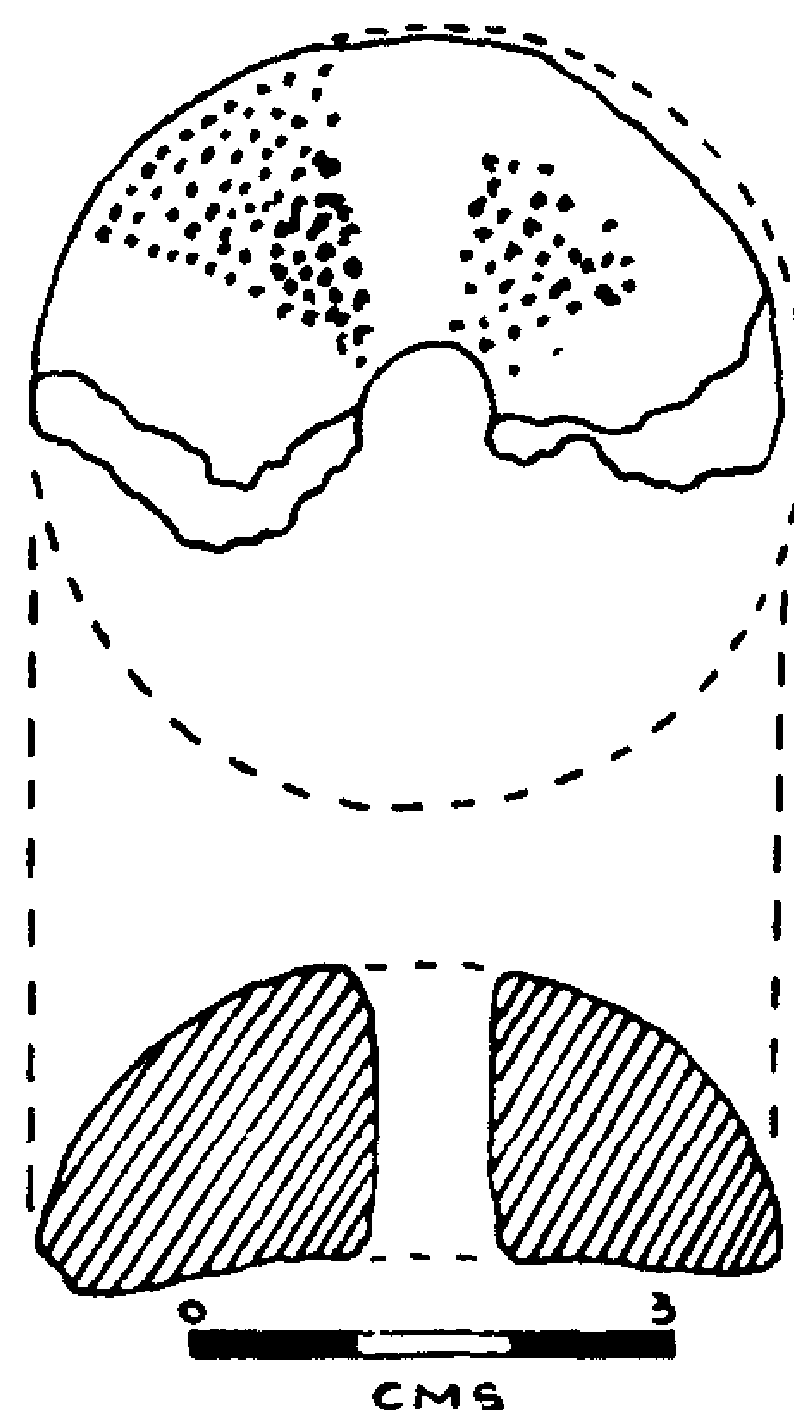


Fig 15b

tion of the human body. Another notable find from this period is a terracotta spindle whorl. It is plano-convex in shape, and bears on its flat surface a frieze of punctured triangles. (Fig. 15b).

Three burials were found in the chalcolithic levels. All of them are flexed, revealing a typical sleeping position. Their orientation is east-west. The funerary offerings in the case of three burials include respectively,

(1) two groups of eight clay pots, two copper arrow heads and several animal bones kept originally as chunks of meat. One large animal bone is kept so close to the body that there can be no doubt as to its intentional character (Pl. VIIIb).

(2) two groups of four clay pots, one copper arrowhead, one copper spear-head and one copper awl, a necklace of thirty-five stone and bone beads (with quite a few more still likely to be buried in the sand sticking to the skull), a terracotta spindle whorl, and several animal bones; (Pl. IX), and

(3) a single clay pot kept right over the skull.

If the single burial of Phase I is representative of the burial practice of that period, then the changed mode of orientation in Phase II might mean the arrival of a new people or only a change in the burial custom.

A comparison of the Bagor chalcolithic culture with that of Ahar reveals that they belong to two quite differen traditions.

(1) While the lithic industry is completely absent at Ahar, it is a very important part of the Bagor culture.

(2) The Aharian economy was based essentially on food production. There is evidence of the cultivation of rice. Domesticated animals include cattle, buffalo, goat, sheep, pig and dog. Hunting, fishing and fowling played only a subsidiary role in it. Bagorean economy on the other hand is basically of hunting and food-gathering type with agriculture and stock-raising playing only a minor role.

(3) Ahar pottery is largely wheel-made, mostly well fired, and has a considerable diversity of fabrics, forms and decoration. The Bagor pottery is largely handmade and ill-fired, has a limited repertoire of fabrics, forms and designs, and is totally devoid of painted decoration.

(4) Aharian architecture consists of substantial houses of stone and mud; there is even evidence of the use of sun-baked as well as kiln-baked bricks and of complex structures at Gilund. At Bagor, on the other hand, hardly any structural features can deserve the name of walls or houses.

(5) The Aharians knew the art of metallurgy while the Bagoreans almost certainly obtained their metal tools by trade.

To sum up, while the Ahar culture is a case of a true farming people settling on virgin ground and colonising a new area, the Bagor chalcolithic is a case of an essentially food-gathering community adopting, rather hesitantly, incipient agriculture and certain material traits like pottery and metal tools of a true village farming community way of life. Bagor provides a good example of acculturation in a prehistoric community. This suituation of a neolithic-chalcolithic economy assimilating within its fold a food-gathering community can be understood better if Bagor is viewed against its ecological background. Bagor is situated to the west of the Ahar culture province. The countryside around is mostly rocky and still largely covered with an open forest of Khejri (*Prosopis spicigera*) Dhak (*Butea frondosa*) and Khajur (*Phoenix sylvestris*) trees. Herds of deer can still occasionally be seen in the vicinity of the prehistoric site. Small game like rabbits, fox, jackal, partridge and sand grouse is even now quite plentiful. Westward as one approaches the Aravallis other wild animals like the Nilgai and wild boar are met with. Records show that

even in recent times the Aravallis were rich in wild life. Some four millennia ago when agriculture and domestication had not been introduced, the forests must have been denser and the wild life richer. Close to the site of Bagor itself an abandoned course of the Kothari survives as a large depression which must have teemed with fish and bird life as it does to some extent even now. Such an ecological situation was ideal for the existence of a hunting-food-gathering society. Primitive hunters and food-gatherers therefore continued to flourish here until they were exposed to the impact of food-producing village settlements of the river valleys to the south and east. It is under the impact of such agricultural community that Bagor received the stimulus of a farming economy and material traits that usually go with a village farming community.

Dating

A series of five radio-carbon dates obtained from the analysis of charred bone samples at the Tata Institute of Fundamental Research, Bombay give us an idea of the antiquity of the Phase I and II cultures of Bagor. The dates are quite consistent among themselves. According to these dates the Phase I culture goes back to about 3800 B.C. while the chalcolithic culture began about 2800 B.C. More C-14 samples are being measured at the Tata Institute, and the chronological picture is expected to become clearer when the results of these measurements are known. On the basis of these dates the chalcolithic occupation of Bagor stands out as the oldest known within Indian borders. Archaeologically, this early dating will not appear to be unexpected in view of the very primitive stage of chalcolithic culture at Bagor. For the upper limit of this culture we have no radio-carbon dates for adequate bone samples were not available from the upper levels. But the typology of iron arrowheads suggests that by the middle of the first millennium B.C. iron had come into use. That may therefore be regarded as the upper limit of the chalcolithic culture for there is no break between Phases II and III.

Copper Implements

Reference has earlier been made to copper implements found associated with two burials of Phase I. Of these implements the three arrowheads (Fig. 16) are quite unique and deserve some discussion. All the three arrowheads found are of triangular shape. Two have an internally curved or concave base, and one has prominent outgoing barbs, but none of them has a stem or tang. They range in length between 25 and 22 mm., in width between 24 and 19 mm., and in thickness between 2 and 1.5 mm. Each of them was provided with two holes near the base. These holes were clearly designed to secure the arrowhead to its shaft either with the help of metal rivets or wire or with a string. Although two types can be recognized in them, the barbed variety is actually an elaboration of the concave-based variety resulting from an accentuation of the basal concavity. And elsewhere numerous graduations exist from the moderately con-

cave-based form to the exaggeratedly barbed form. The two types can thus be treated as variants of a single concave-based type.

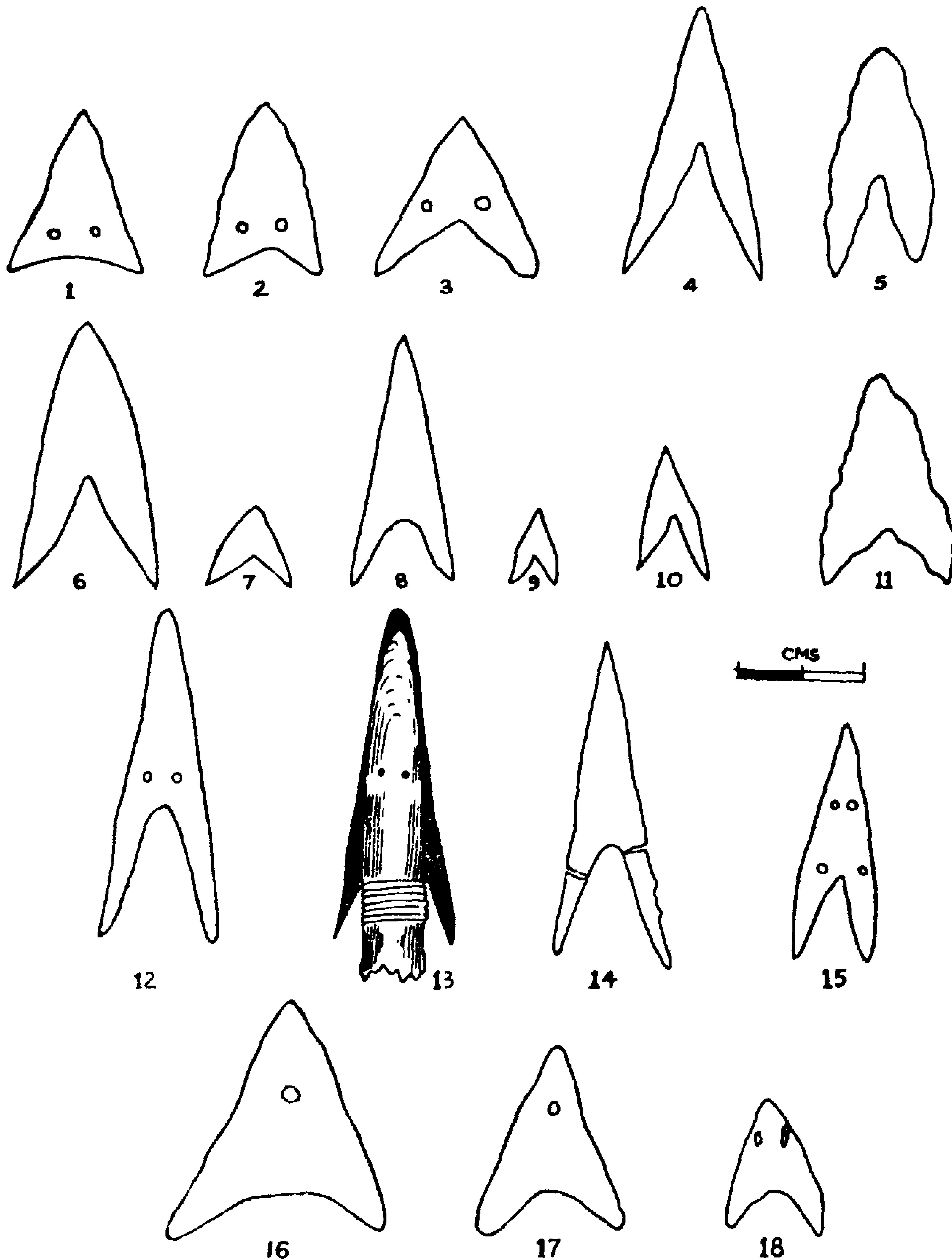


Fig. 16

The indigenous origin of these arrowheads is unlikely as the technological level of the Bagoreans of Phase II does not warrant crediting them with the knowledge of metallurgy. Nor can the arrowheads be derived from the Ahar culture for such arrowheads are unknown at Ahar as well as at other sites.

They are equally unknown in the other chalcolithic cultures of peninsular India. However, barbed arrowheads of copper are known, singly or severally, from many Harappan sites. These include Kalibangan[4] (the nearest Harappan site to Bagor to have yielded an arrowhead of this class), Harappa[5], Mohenjo-daro[6], Chanhu-daro[7], Kot-Diji[8], Jhukar[9], Shah-jo-kotiro[10] and Sutkagen-dor[11]. They are therefore known from almost the entire Harappan culture province except Gujarat. But what is more, with the exception of a single leaf-shaped stone arrohead from Harappa[12] and a tanged copper arrowhead from Chanhu-daro[13] the barbed variety is the only arrowhead known in the Harappa culture, and it may well be regarded as a type fossil of the culture. At Mohenjo-daro, the only site which has yielded such arrowheads in quantity, they occur right from the beginning of the settlement though they are more common in the upper strata[14].

There are two minor differences between the Harappan and Bagor arrowheads : (1) The Harappan specimens are generally longer and narrower though short and broad forms are also known, and in particular one specimen from Chanhu-daro is almost identical to the barbed arrowhead from Bagor except that the former is slightly smaller[15]. (2) The Harappan arrowheads do not possess holes, and are therefore believed to have been hafted to their shafts with the help of some kind of cement. This less efficient hafting device only shows that the Harappan forms represent a more archaic stage of development for both types – with holes and without -- are ultimately derived from the holeless type in stone.

In our present state of knowledge the Bagor arrowheads can be related only to the Harappan forms within the Indian cultural province. The relationship between these two cultures could, however, have been only an indirect one for there are no other Harappan links at Bagor. Perhaps the Bagoreans obtained their metal supplies from itinerant coppersmiths some of whom also catered to the needs of the Harappan peoples. A modern parallel of such a situation in this same region is provided by the nomadic blacksmith (Gadia *Lohars*).

Outside India stemless barbed arrowheads of copper/bronze are known from Transcaucasia, the Aegean and the Swiss Lake dwellings. In Transcaucasia the type occurs in tombs of early iron age. It has a curved base as at Bagor but only one hole placed nearer the tip rather the base[16]. In the Aegean, such arrowheads are known both from the mainland and from the island of Crete. They are common at Prosymna[17], Asine[18] and numerous other sites. The type is elongated with prominent barbs and has two, three or four holes. It occurs in tombs of Late Helladic I-III age, and can thus be dated from c. 1600 B.C. to 1100 B.C. In Crete several hundred barbed arrowheads occurred at Knossos in the ' Armoury Deposit ' of Late Minoan III period[19]. They have only two holes as at Bagor. The type is also present at several other sites on the island[20],

and goes back to Late Minoan I times. In Swiss Lake dwellings it is known from the Early Bronze Age[12].

What is, however, more significant is that in these regions the bronze arrowheads occur alongside those of stone which are without holes. The stone examples occur even in earlier periods in the Aegean, North Persia and the Caucaus, and did no doubt provide the prototypes for copying in copper/bronze when metal became available. Indeed the stone prototype can be traced to the Upper Palaeolithic of Europe. It is very common and widespread in the Late Stone Age and neolithic cultures of Africa, and in the neolithic and bronze age cultures of Europe and Russia. The stone prototype is, however, conspicuous by its absence in India. Therefore, both the Harappan and Bagor arrowheads are in the final analysis of non-Indian origin, derived from the west. It is of course not possible to point out any precise locality for their derivation. What can, however, definitely be said is that the type is not derived from Mesopotamia for it is completely unknown in that region. It is more likely to have come from north Persia and Transcaucaisa. It is quite possible that the Harappan and Bagor arrowheads might have been independently derived from the same or different sources. In any case, the Bagor arrowheads are likely to date around the middle of the third millennium B. C. in view of their typological similarity with Harappan arrowheads. This dating will be consistent with the C-14 dates mentioned above.

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INVESTIGATIONS OF THE PLEISTOCENE SEDIMENTS FROM THE BELAN VALLEY, U.P.

G. G. MUJUMDAR and S. N. RAJAGURU

The INDO-GANGETIC plain forms the largest zone of the Pleistocene formations in India and provides an ideal situation for the study of the Pleistocene environment of a region lying between the glaciated Himalayas and the non-glaciated tropical Peninsula. The Siwalik hills on the northern border of this plain have yielded good evidence of Stone Age industries in association with river terraces and attempts have been made to correlate these terraces with glacial and interglacial stages of the Himalayas (LAL, 1969). In the main alluvial tract of the Gangetic plain two types of deposits, Older (Pleistocene) and Younger (Holocene), have been observed along with the typical Middle Pleistocene animal fossils (Pascoe, 1963). However, no Stone Age tools have so far been discovered in the main portion of the Gangetic plain. The southern fringes of this plain have recently yielded Stone Age tools along with animal fossil bones at some places. Thus these southernmost areas of the Gangetic plain have become ideal places for finding out relationship of the Pleistocene deposits and the associated Stone Age industries of the Siwalik hills with those of the Indian Peninsula lying south of the Vindhyan mountain.

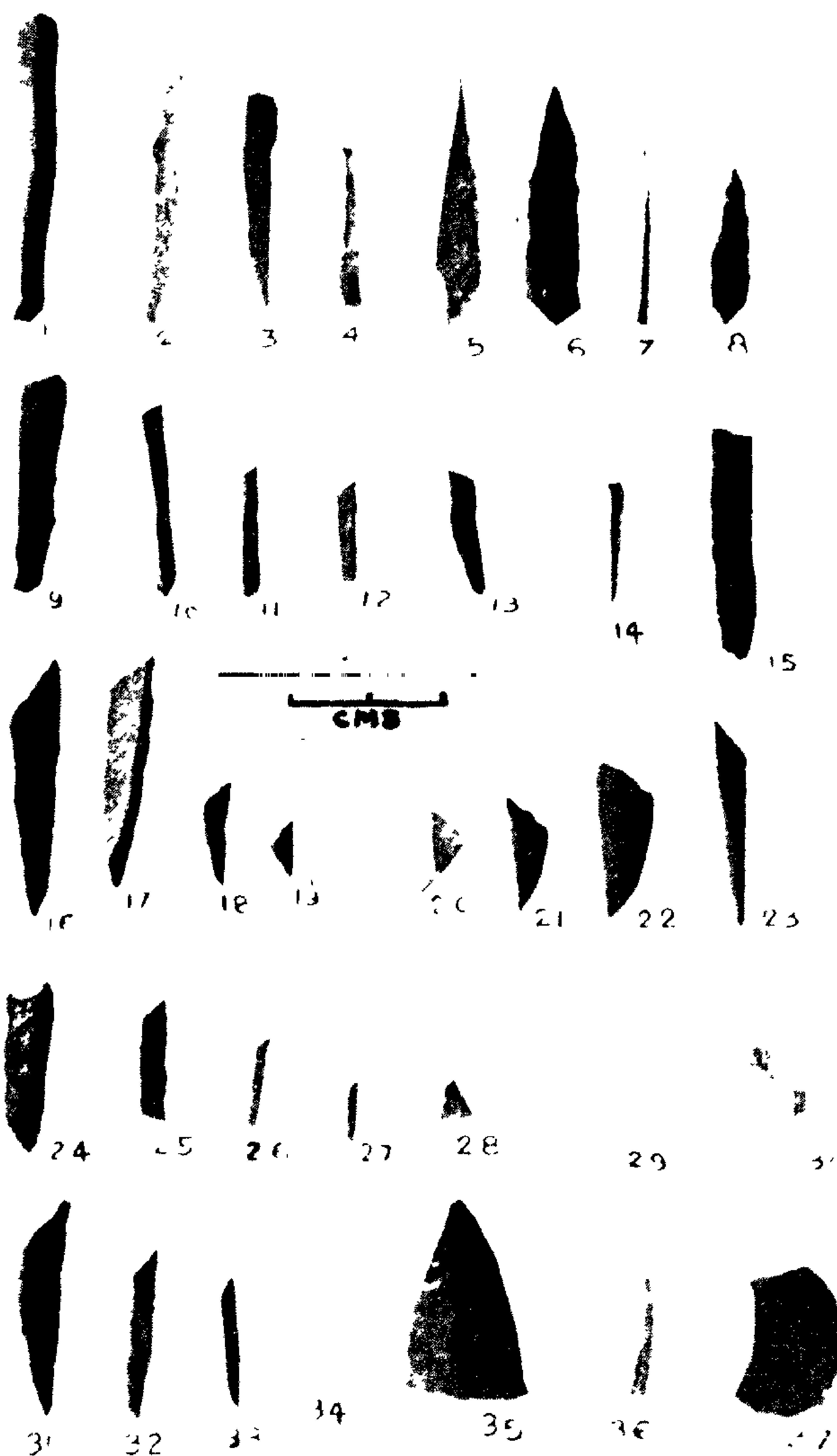
In recent years G. R. Sharma (Sharma, 1967) of Allahabad University discovered a prehistoric site near Khajuri on the river Belan, a trubutary of the river Tons, in the Meja subdivision of Allahabad district of Uttar Pradesh. At the suggestion of H. D. Sankalia, we visited this site in November 1967, and collected soil samples for laboratory studies. Our main aim in studying these alluvial deposits was to throw light on the probable Pleitocene environment and chronology of Stone Age cultures of this area.

STRATIGRAPHY OF THE AREA (From Top to Bottom)

According to G. R. SHARMA the stratigraphy is given on p. 97.

Both the gravels CG.I and CG.II have yielded a large number of mammalian fossil bones.

The soil and gravel samples (as per table Nos. 1 and 4) were studied in the laboratory for knowing particle size distribution, pH, calcium carbonate,



Pl. VII : Microliths from Bagor



Pl. VIIIa : Mace-heads from Bagor



Pl. VIIIb · Burials from Bagor

Layer No.	Avarage Thickness	Description	Industry
1	1.52 m.	Brownisn clay	Geometric Microlihs with Pottery.
2	2.43 m.	Blackish coarse clay	-do-
3	1.82 m.	Whitish clay rich in Calcium Carbonate.	Upper Palaeolithic blade Industry and non-geometric microliths without pottery.
4	1.21 m.	Cemented gravel III (CG. III)	Upper Palaeolithic blade industry.
5	1.52 m.	Yellowish silt (rich in clay)	Tools of Middle Stone Age plus Upper Palaeoliths.
6	1.52 m.	Red coloured gravel deposit.	Tools of Middle Stonh Age mostly on Chert.
7A		Cemented gravel II A	Middel Stone Age tods on Chert.
7B		Cemented gravel II B	Middle Stone Age plus quartzite tools.
7C		Cemented gravel II C	Transition bet. Early Stone Age and Middle Stone Age tools on quartzite
8	3.40 m.	Silt.	No implements.
9	1.28 m.	Cemented gravel I (CG. I)	Early Stone Age tools.
10		Decomposed rock	No implements,
11		Fresh rock	

organic matter and salinity contents, mineral composition and morphometry of fine sand particles. Soil samples were treated with dilute hydrochloric acid and then analysed by International Pipette Method for finding out the particle size distribution. Organic matter and salinity measurements were made by using colorimetric and conductometric methods respectively. For morphometric studies sand grains ranging in size between 10 mm to 0.16 mm. were selected and after removing calcium carbonate and ferruginous coatings were studied under binocular microscope as per method suggested by KRUMBEIN and SLOSS. (1963, p. 111). Sand grains ranging between 0.2 to 0.02 mm. were selected for mineral studies under petrological microscope. The results of our field and laboratory studies have been discussed in the end.

Sampling Procedure

Suitable samples were collected from the various layers exposed in the section in the following manner. An area of 25 × 25 cm. was scraped so as to expose the inner fresh surface 15 cms. inside. From this fresh surface the sample weighing about 500 gms. was removed, as far as possible, in a single block which was afterwards wrapped in a paper and the whole stoared in a cloth bag after proper labelling.

Table No. 1

Details of soil samples collected

Sr. No.	Sample No.	Site	Locality	Layer No.
1	AU/Belan/67/2	Belan	1C (Main sec tion)	8
2	AU/Belan/67/6	,,	,, ,,	6
3	AU/Belan/67/7	,,	,, ,,	5
4	AU/Belan/67/9	,,	,, ,,	3
5	AU/Belan/67/12	,,	,, ,,	1
6	AU/Belan/67/14	,,	1D (Main sec- tion)	Silt inter- venening betwenn CGIIC and CGIIB.
7	AU/Belan/67/14	,,	,, ,,	Silt betwene CGIIB and CGIIA.
8	AU/Seoti/67/18	,,	Seoti III	Silt above CGII
9	AU/DHN/ (Mando) /67/28	Chopani	Old Belan	3
10	AU/CPN/ (Mando) 67/29	,,	,, ,,	2
11	AU/CPN/ (Mando) /67/30	,,	,, ,,	1

Table No. 2

Mechanical Analysis of soil samples

Sr. No.	Coarse sand % 2 mm to 0.2 mm	Fine Sand % 0.2 mm to 0.02 mm	Silt % 0.02 to 0.002 mm	Clay % Less than 0.002 mm
1	6·7	19·3	34·0	40·0
2	7·5	52·5	32·0	8 0
3	0·5	53·6	30·0	16·0
4	1·0	65·0	24·0	10·0
5	0·5	29·5	40·6	30·0
6	1·25	48·75	30·0	20·0
7	26·10	17·90	40·5	15·5
8	7·6	68·4	19·5	
9	4·35	45·65	40·0	10·0
10	8·5	23·6	33·9	30·0
11	11·6	16·4	32·0	40·0

Table No. 3

Physical and Chemical analysis

Sr. No.	Colour (Munsell)	pH	Salinity (in mmhcs.)	$CaCo_3$ %	Org. C %	Humus %
1	10YR7 2 light grey	8·1	0·185	17·5	pract. nil	pract. nil
2	5YR6/6; reddish yellow.	8·1	0·4	32·5	,, ,,	,, ,,
3	,, ,,	7·95	0·2	4·0	,, ,,	,, ,,
4	,, ,,	7·80	,,	Pract. nil	,, ,,	,, ,,
5	7·5YR7/6; reddish yellow	8·00	0·25	8·8	0·25	0·43
6	7·5YR7/4; pinkish	7·00	0·18	3·4	pract. nil	pract. nil
7	,, ,, ,,	7·30	0·17	,,	,, ,,	,, ,,
8	7·5YR7/6; reddish yellow	8·00	0·3	13·5	,, ,,	,, ,,
9	7·5YR5/6; reddish yellow	7·30	0·15	3·5	0·21	0·37
10	,, ,, ,,	6·9	0·2	3·9	pract. nil	pract. nil
11A	7·5YR3/2; dark brown.	6·5	0·1	4·0	0·35	0·62
11B	7·5YR7/6; reddish	7·5	0·35	6·2	0·21	0·37
11C	,, ,, ,,	7·7	0·52	10·0	0·16	0·28

Table No. 4

Details of Gravel Samples collected

Sr. No.	Sample No.	Site	Locality	Layer No.	Remarks
12	AU/Belan/67/1	Belan	IC (Main section)	9	CG.I
13	„ /3	„	II (Chillahia)	7	CG.II-C
14	„ /4	„	„	7	CG.II-B
15	„ /5	„	„	„	CG.II-A
16	„ /13	„	ID (Main sec.)	7	CG.II-C
17	„ /15	„	„	„	CG.II-B
18	„ /17	„	„	„	CG.II-A
19	AU/Lohanda/87/19	Lohanda	I		CG.I
20	„ /20	„			CG.II
21	„ /21	„	II		CG.III
22	AU/Ramgarh/67/23	Ramgarh Nala			CG.II-C
23	„ „ /24	„			CG.II-B
24	„ „ /27	„			CG.III

General Observations

FIELD CHARACTERS OF THE GRAVELS

CG.I. (GRAVEL I) : It is about 1.5 m. thick and mainly occurs as a sheet gravel. It contains pebbles of the size ranging between 2 cm. to 15 cms. the average size being 5 cm. to 8 cm. (diameter). Slabs of sandstone derived locally from Vindhyan formation, also occur throughout the thickness of CG.I. A slab measuring as big as 0.5 m. in length was found to be incorporated in CG.I. The pebbles of sandstone, arenacious shale, quartizitic sandstone, laterite and jasper are of common occurrence. A few pebbles of cryptocrystalline silicious material were also encountered. The matrix of this gravel is mostly clayey and ferruginous and the cementing material is calcium carbonate. The whole deposit is very well consolidated. This orthoconglomerate is poorly sorted, unimbricated, polymodal in composition and is dominated by sub-angular to sub-rounded pebbles.

CG.II. (GRAVEL II) : It covers a much larger area than CG.I. and reaches its maximum thickness up to 5 m.. The average size of pebbles is in between 2 to 4 cms. and bigger pebbles measuring upto 12 cms. occur predominantly in the lower portions. Sandstone slabs are common in the basal portions and sometimes a few of them appear in the upper horizons also. Petrologically it does not differ much from CG.I. excepting that its middle and upper parts contain more tools made on cryptocrystalline silica. The gravel is very well cemented and at places intervened by silty layers. It is cross-bedded, fairly sorted better rolled and more mature than CG.I.

CG.III (GRAVEL III) : The original significant feature is that it is much finer and of wider occurrence than CG.II and CG.I., otherwise it does not differ much from CG.II in composition and texture.

LABORATORY STUDIES

The gravel samples were subjected to a treatment of dilute hydrochloric acid in order to loosen the components cemented together by the limy material. After washing they were subjected to wet sieving in which only the grain size ranging between 10 mm. and 0.16 mm. were retained for studies discarding the other sizes including the cementing lime. The following table incorporates these results.

Table No. 5

Particle size distribution of matrix of gravels

Gravel	loss on treatument	10 mm to 2 mm	2 mm to 0.2 mm	0.2 mm to 0.16 mm
CG.III	55%	12%	8%	25%
CG.II–C	45%	2%	37%	16%
CG.II–B	49%	10%	14%	27%
CG.II–A	36%	4%	40%	20%
CG.I	37%	49%	12%	2%

The various sand fractions, after removing calcarious and ferrugenous coatings, were situated under binocular microscope and the rounding index was determined.

MORPHOMETRIC STUDIES

(Degree of roundness expressed in percent)

Gravel	10 mm to 2 mm			2 mm to 0·2 mm			0·2 mm to 0·16 mm		
	R.	S.R.-S.A.	A.	R.	S.R.-S.A.	A.	R.	S.R.-S.A.	A
CG.III	12	75	13	20	60	20	2	80	18
CG.II-C	2	75	23	3	85	12	1	80	19
CG.II-B	20	65	5	8	80	12	4	76	20
CG.II-A	10	70	20	4	80	16	1	82	17
CG.I	12	80	8	15	60	25	2	70	28

Note : R means well rounded and rounded
S.R. means sub-rounded
S.A. means sub-angular
A. means angular

Mineral Studies

The fine sand fractions of both silt and gravel samples were examined under petrological microscope. The dominent minerals present are quartz, potash and soda felspars, calcite, and tourmaline. The minerals like biotite, chlorite and epidote are found to occur in small amounts. There is no significant variation in mineral suits of various samples under study. Tourmaline grains show high degree of rounding.

Discussion of the analytical results

1. Both the gravels and slits, exposed in the cliff sections of the Belan, have mainly been deposited through fluvial processes like sheet and channel flooding. The role of wind in depositing loess like silts could not be correctly assessed.
2. The silts show wide variations in their physical properties. In general they are quite rich in clay and coarse sand fraction is not insignificant. They mainly exhibit yellow colour and its various hues and are rich in calcium carbonate concretions. Organic matter is significantly less. The particle size distribution of silt samples definitely indicate their heterogenity and poor sorting. For a wind deposited silt i.e. 'loess' 97 to 99.5 per cent of grains should be below 0.2 mm. and are generally poor in particles below 0.002 mm. (clay fraction) (BUTZER, 1964, p. 194). Considering the richness of clay components and of significant proportion of coarse sand franctions and also the association of these silts with lenses of water laid gravels and sands the possibility of these finer soils being deposited solely by wind is very meagre. On the other hand particle size analysis suggest their deposition as either overbank deposits or as fluvio-lacustrine deposits associated with floodplain environment. Besides, these finer soils are weakly laminated and apparently massive, thus indicating their deposition in sustained still water conditions, such as those existing in a lake.

3. 'Samples 11A, 11B and 11C from Chopani excavations clearly indicate the development of a weathering profile. Sample No. 11A is dark brown in colour due to more organic carbon or humus while Nos. 11B and 11C are reddish yellow and contain less humus. Leaching of calcium carbonate from No. 11A and enrichment of it in No. 11C is also quite evident. All these results suggest that sample No. 11A forms a top humus rich layer of a soil profile developed due to *in situ* weathering of alluvium represented here by samples 11B and 11C.

4. The silty layer between CG.IIC and CG.IIB is of localized nature and therefore cannot be used as a reliable rock unit in the stratigraphic studies.

5. Boulder conglomerate or CG.I appears to have been deposited on a pediment surface belonging to a Kaimur Scarp complex. The outcrops of CG.I are mostly confined to Belan-Seoti doab between Goldahawa and Mandu.

It occurs mostly as a sheet deposit. The dominance of sub-angular to sub-rounded pebbles over well rounded ones, the incorporation of locally derived sand stone slabs throughout the total thickness of CG.I indicate that mass wasting and sheetflooding processes were dominant during the deposition of CG.I. Poor sorting and chaotic composition of these ortho conglomerates also point to highly turbulent flow conditions. On the other hand CG.II and CG.III are more mature and better sorted and seem to have been deposited as point or channel bars of the Belan. The cross-bedding and the thickness of these gravels suggest considerable depth of water column and uniform flow conditions in the stream. The associated massive deposits of silts also suggest considerable discharge and higher capacity of the stream.

6. The particle size analysis of the matrix of these gravels only shows how coarse CG.I is in comparison with CG.II and CG.III. Morphometric studies clearly demonstrate that the degree of roundness of sand grains decreases as the particle size reduces. The presence of a few very well rounded quartz grains in fine sand franction is quite interesting. As is well known these rounded grains are likely to have been derived from Vindhyan sandstone which are supposed to contain windworn rounded grains of quartz. Besides, the rounding of quartz grains is accomplished after several generations of transport. Hence mere presence of well rounded quartz grains does not help us in finding out the role of wind in depositing these sediments during the Pleistocene.

7. As there is no significant change in mineral composition of either gravels or silts it can be said that there were no major changes in the stream regimens during the period under consideration.

8. There is a major disconformity between clayey silt I and CG.II. In the overlying sequence the disconformities are local and cut and fill structures are common. Further, the bore-hole data collected at the nearby Belan Bridge site indicates that the yellow kankary silt of the Pleistocene age is directly resting over the rock at a depth of about 6 m below the modern bed level of the Belan. The older alluvium has been mostly replaced by sub-recent alluvium characterised by black brown silt and sand which are about 6 to 8 m. thick at the bridge site.

9. The present Belan appears to be a misfit and a rejuvenated stream. The presence of pot holes at a level of about 5 m in the gravel II indicate very recent rejuvenation of the Belan. Recent changes in the course of the Belan are evident. Briefly the massive alluviation in the late Pleistocene, the sustained still water conditions during the deposition of clayey soils and the present misfit and rejuvenated stage of the Belan are the important salient features of the Pleistocent geomorphology of the area under consideration. These features seem to be very closely connected with

(a) tectonic history of the Gangetic Valley and the Kaimur range,
(b) climatic changes of the Pleistocene.

(a) The major upthrust of the Himalayas occurred sometimes in the Middle Pleistocene and the southerly monsoons were naturally prevented from their further movement on the northern slopes of the Himalayas. The southern slopes therefore started receiving more precipitation and consequently, both due to higher rainfall and strong uplift of the Himalayas, the rate of erosion increased and so also the acceleration in the process of sedimentation in the foredeep of the Ganges. The increased sedimentation from the north might have pushed the main Gangetic drainage towards south which ultimately had profound back-water effect on the Tons, Belan etc. These conditions might have favoured heavy sedimentation in the Belan during the late Pleistocene. The tectonic movements are likely to be of pulsating character and to some extent they explain the presence of minor erosional phases in the Belan. The Kaimur range itself might owe its present elevation to the epeirogenic movements that occurred in the Peninsula during the late Tertiary and the Pleistocene.

(b) The lowering of snow-line by about 2000 meters from the present level in the Himalayas during the Upper Pleistocent might have depressed the mean annual temperatures in the Gangetic basin by 5°-6°C. The glacial conditions in the Himalayas most probably created storminess along the contact of southerly monsoons with cold front in the north (CHARLESWORTH, 1966). These conditions might have favoured greater moisture in the area under consideration. Naturally due to more precipitation there was probably more erosion and increased sedimentation in the Belan. The present misfit condition of the Belan also suggest similar moist condition in the late Pleistocene. The present rejuvenated course could have resulted in response to reduction in the discharge and sediment load in the subrecent times. Such conditions are not only seen in the Belan but also in the whole of the Peninsula.

The epeirogenic movements and the climatic changes of the late Pleistocene seem to be mainly responsible for the massive alluviation and the present rejuvenation of the Belan. For knowing the exact nature of tectonic and climatic changes of recent times much more detailed geomorphological and sedimentological investigations are necessary not only in the Belan but also in the Kaimur range and in the adjacent stream valleys like Tons, Seoti, etc.

From these laboratory and field studies it has not been possible to arrive at some definite conclusions in regard to the chronology of the Stone Age cultures found in the Belan. The stratigraphic sequence as suggested by Sharma appears to be sound and gives us some idea about the relative chronology of various Stone Age cultures. But the absolute dates and the exact time gap involved in various cultures are difficult to predict. In this connection the results of palaeontological investigations carried out by the Geological Survey of India are of great interest.

In our opinion this is one of the rarest Prehistoric sites so far discovered in India where all the three stratigraphic units, viz. rock, faunal and cultural,

have been well preserved in a comparatively small area. Detailed study of this area will provide a standard yardstick for Stone Age chronology of India with particular reference to the Peninsula. In addition to its cultural aspect, the site provides ideal situation for the future investigation by Geologist, Soil scientist and Palaeontologist and it may be probably at this site that some early human fossils will be discovered in future.

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BLADE-AND-BURIN AND LATE STONE AGE INDUSTRIES AROUND RENIGUNTA, CHITOOR DISTRICT,

M. L. K. MURTY

INTRODUCTION

THE PREHISTORIC cultures of the Pleistocene and early Holocene period of the Indian sub-continent are characterized by three successive industries: (1) Early Stone Age, (2) Middle Stone Age and (3) Late Stone Age which correspond (through not chronologically) to the Lower Palaeolithic, Middle Palaeolithic and Mesolithic or the synonymous industries of the other parts of the old world, respectively. In the latter regions sandwiched between the Middle Palaeolithic and Mesolithic is a distinctive cultural phase called as Upper Palaeolithic characterized by blade-and-burin industries.

FOOTE (1916), CAMMIADE and BURKITT (1930), GORDON (1950, 1958) and SANKALIA (1946, 1958, 1960) to mention a few with their pioneer studies in various parts of the country recognized the importance of assemblages of artifacts with blade tool technology that stratigraphically post-date the Middle Stone Age and precede the Late Stone Age or otherwise occur loose on the surface along the river banks. Because of their stratigraphical position and their typological similarities to the blade component of the Upper Palaeolithic (SANKALIA 1962) while explaining different stages of Stone Age cultural succession postulated the likelihood of Upper Palaeolithic also in the Indian Subcontinent. It is in this context the evidence from the sites around Renigunta is most significant; since here are found blade-and-burin industries most typical of the old world Upper Palaeolithic than the others known to date in the various parts of the country; and also the non-geometric microlithic industries of the Late Stone Age (or Mesolithic) period. A contrastive study of both the industries here reveals the distinctive Upper Palaeolithic nature of the blade-and-burin industries which is of immense importance to fill the gap, between the Middle and Late Stone Ages. For, in the Indian prehistoric culture succession, no cultural phase synonymous with the Upper Palaeolithic has not been included due to the discontinuous and less prolific distribution of Upper Palaeolithic-like industries.

SITES AND THEIR PHYSIOGRAPHY

All the sites are situated towards the north-east of Renigunta in the eastern part of Chittoor district of coastal Andhra Pradesh. Renigunta is an important railway junction on the Madras-Bombay route, because of its situation approximately ten kilometres to the east of Tirupati the richest pilgrimage centre in India dedicated to 'Lord Venkaeswara'. This part of the district is a plain land region much broken up by hills, spurs and off shoots and the most prominent are the Nagari hills terminating in the hills of Tirupati. Geologically the Archean rocks underlay all the formations. They build the edges and rugged scarps and are all cut through by granite veins, quartzite veins and trap dykes. The Archeans are covered by Cuddapah and Kurnool series; and the Nagari quartzites that form the adjoining hills of Nagari, Tirupati and Kalahasti belong to the second (the Cheyyeru series) of the four series of Cuddapah formations. The other geological formations are absent excepting the Pleistocene and recent alluvial deposits and soils. This region is drained by the river Rallakalava which is a mountain stream arising in the Tirupati hills and after flowing through a valley tract, it opens into a plain tract six kilometres north of the village Vedullacheruvu. Here another mountain stream namely the Konamadugu joins the Rallakalava and both flow as a river known by the single name Rallakalava. Rallakalava finally merges on the left into the major river Swarnamukhi which drains into the Bay of Bengal through the adjoining Nellore district. The Rallakalava has preserved two aggradational terraces comprising gravels and silts, respectively; yielding Early and Middle Stone Age industries. The blade-and-burin and the Late Stone Age industries occur either on the eroded first aggradational terrace along the banks or in the areas slightly away from the river.

The blade-and-burin and the non-geometric Late Stone Age industries are recovered from (1) various localities around Vedullacheruvu and (2) Nallagundlu; and the blade-and-burin industry occurs exclusively at (3) Timmayyagunta (4) Venkamanayanipalli and (5) Chundi. In the first two sites industries of both the traditions are confined to workshop centres. Vedullacheruvu is a small village situated 3.8 kilometres north-east of Renigunta and both the industries occur at locality 6 which extends upto six kilometres upstream from the village on the right bank of the Rallakalava. The industries occur on the surface of the eroded first-aggradational terrace in concentrated spots and they can be easily distinguished by their size and raw material which is fine grained quartzite in the case of blade-and-burin industry and milky quartzite in the case of Late Stone Age industry. At localities 1 and 3 of Vedullacheruvu the Late Stone Age tools occur exclusively. Locality 1 is approximately 5 kilometres (from locality 6) on the down stream right bank Rallakalava on the right side of the Tirupati-Kalahasti road. Locality 3 is just opposite to Locality 1 on left bank of the eroded first aggra-

dational terrace. Nallagundlu (black round boulders) is a local land mark approximately 1.5 kilometres west of Vedullachervu and is a rich factory site of both blade-burin and Late Stone Age industries. Scraping of the sections here in an area of 12 square feet divided into squares of four feet each labelled as NGL-A, NGL-B, NGL-C and NGL-D disclosed that the blade-and-burin industry occurs exclusively eight inches deep from the surface; although they occur in small numbers on the surface alongside with Late Stone Age tools. These artifacts of blade-and-burin industry at a depth of eight inches in the respective squares are labelled (by drawing a circle around the square name) as NGL (A), NGL (B), NGL (C) and NGL (D) to distinguish them from those on the surface. This stratigraphical situation indicates that the blade-and-burin industry was older than that of the Late Stone Age. The artifacts of both the industries are found together on the surface due to the erosional activity of the seasonal rains that run down the slopes washing away the sandy silt and consequently mixing up the artifacts of both the industries. The artifacts of both the industries found on the surface in the general area of Nallagundlu are labelled as NGL and it was easy to isolate them considering their size and raw material as in the other localities of Vedullacheruvu. Timmayyagunta is 2.3 kilometres north of Renigunta and a few kilometres above the former is Venkamanayanipalli. The artifacts of blade-and-burin industry do not occur prolifically at these two places and also at Chundi which is approximately 6.6 kilometres to the east of Renigunta on the downstream left-bank of Rallakalava. The blade industry is present on the right bank of the river opposite to the village Chundi. The area of Thimmayyagunta, Venkamanayanipalli and Nallagundlu are situated away from the river and this region, once the aggradation plain of Rallakalava, is an undulating land surface with exposed and eroded out crops of quartzite covered by heaps of rolled and angular pebbles, gravels and silts.

THE BLADE-AND-BURIN INDUSTRY

The dominant attribute of this industry is the blade and tools made on blade which are detached from fluted cores. There are also other tools made on flakes and cores such as scrapers and choppers. These blades are long, massive as well as slender with parallel or irregular sides having one or more longitudinal ridges on the surface. They exhibit triangular, trapezoidal and sector like (like an orange piece) cross sections. The raw material is mostly fine grained quartzite of olive green shade though medium-to-coarse grained quartzite is also used. A few tools were also made on milky quartz, crystal and black lydianite.

The method of blade production by fluted core technique appears to be a further development of the prepared core technique that was used in the preceding Middle Stone Age industry. This can be best understood by means

of a few reject cores found at Locality 6 of Vedullacheruvu, which were abandoned after the initial dressing due to the faulty nature of the raw material. These are big lumps of quartzite with a natural flat top that served as a platform. They display convergent flake scars on one side while on the other are a few broad more or less parallel scars pointing downwards, suggesting the initial dressing by a cylinder hammer. The primary flaking was multidirectional done in a circular fashion so as to result in slightly convex surfaces which is evidenced by the cross and parallel flake scares on the dorsal side of some of the first detached flakes and broad blades. Some of the residue cores suggest that after the primary dressing one or both the ends are slightly trimmed at right angles to the convex surfaces, whenever necessary, to facilitate a suitable platform for detaching the blades. Now, along the circumference of the core are struck off a series of blades with the help of an intermediate punch and light hammer. After the first round is over the process is repeated by striking above the intersection of earlier scares and when the blow is struck a little inside from the periphery, thick and broad blades are removed which show more than on ridge on the dorsal surface. These blades are struck off either from one end or from both the ends and when the core is fully exploited, it is split into pieces and these are mostly utilized for the burins. The blades are eventually finished into various forms such as backed points, knives, lunates, etc., by means of blunting and pressure retouch.

The present collection comprises 5993 specimen, of which, (1) 1378 belong to Vedullacheruvu locality 6 (VDCH LOC. 6); (2) 558 to the general area of Nallagundlu (NGL); (3) 62 to the subsquare A (NGL-A), 181 to the subsquare B (NGL-B), 65 to the subsquare C (NGL-C), 109 to the subsquare D (NGL-D) —obtained from the surface of the twelve square foot area; (4) 239 to the subsquare (A) (NGL-(A)), 403 to the sub-square (B) (NGL (B)), 159 to the subsquare (C) (NGL-(C)) and 478 to the subsquare (D) (NGL -(D)) —obtained from 8″ below the surface in the twelve square foot area where scraping was done (excluding the rejected chips on the site which amount to 1864 pieces); (5) 194 to Timmayyagunta (TMG); (6) 176 to Venkamanayanapalli (VNP); and (7) 122 to Chundi (CHD).

In the total collection the finished forms represent 13.2%; blades represent 19.3%; and the other categories represent 67.5%. The length, breadth/length (B/L) and thickness/breadth (T/B) of the 2172 full size specimens (leaving the broken artifacts and chips) are calculated which are summarized below.

The length of the specimens varies from 11 to 105 millimetres : the greatest number (16.40%) fall in the length class of 36 to 40 mm. The B/L index varies from .11 to 1.20; the greatest number (13.3%) fall between .36– .40. The T/B index varies from .11 to 1.2; the greatest number (12.5%) fall between .46 to .50.

The industry is divided into the following categories.

(Apart from these tool types there are six bored stones—four from NGL (C) and two from Vedullacheruvu Locality 6—one from the latter being complete while the remaining are broken.)

FINISHED FORMS :

(a)	Choppers	..	27	
(b)	Scrapers	..	63	
(c)	Burins	..	131	
(d)	Backed pieces	..	532	
(e)	Awls	..	30	
(f)	Points	..	16	Total 799 (13.2%)

OTHER CATEGORIES :

(g)	Blades	..	1170	(19.3%)
(h)	Primary flakes	..	102	
(i)	Flakes	..	215	
(j)	Core flakes	..	379	
(k)	Cores	..	191	
(l)	Chips	..	3137	Total 4024 (67.5%)

(a) CHOPPERS (FIG. 17, NO. 1)

These are heavy tools with bold flaking concentrated along the working edge with a sinuous to straight profile. Out of twenty-seven, nine are on core; two on split pebble; eleven are on thick flake and five are on nodule. Twenty specimens are worked unifacially while the remaining seven are bifacially flaked. These represent 3.2% of the finished forms.

(b) SCRAPERS (FIG. 17, NOS. 2-11)

Out of sixty-three, sixteen are on flake; seventeen on core flake; twenty-two on blade; two on flake blade, three on core; and three are on nodule. Forty-three are side scrapers; fifteen are end scrapers; three are side-end scrapers; one is a ovate scraper and the remaining one is an all round scraper. Most of them (fifty) are unifacially retouched. The retouch on thick core flakes, flakes and cores is comparatively bold. The small parallel sided blades are retouched by delicate pressure retouch on the working side of the implement. Some of the side scrapers on long blades from Nallagundlu are like daggers and the end scraper on a thick flake from Nallagundlu is very neatly finished with a hump in the centre, both the ends thinned and a slightly concave cutting edge. These represent 7.56% of the finished forms.

(c) BURINS (FIG. 17, NO. 12; FIG. 18, NOS. 13-20; FIG. 19, NO. 45)

These are made on thick blades, core flakes, cores and a few on nodules. The burin edge is always present on the robust side of the impliment, which is obtained by the removal of one or more spalls, either vertically or obliquely or in different angles along the longitudinal plane, transverse plane and the margins . The burin edge is mostly confined to one end though there are a few double ended specimens. In a few cases the other end is blunted across the base. These comprise 16.24% of the finished forms.

According to the technique of their manufacture and form, following the classification of Noone (1934 : 81-92) these are grouped into the following types. All the specimen come under the spalled order.

Central	(Nos. 12-13)	....	30
Bevel	(Nos. 14-15)	....	44
Rectangular	(Nos. 16-17)	....	44
Concave	(Nos. 18-19)	....	6
Convex	(No. 45)	....	20
Unfinished	(No. 20)	....	2

Central : The burin edge is produced by the intersection of one or more oblique spalls from each side and opposed to each other. When one of the margins of the blade is steep and curved, serving the purpose of a burin facet only one spall is struck off on the opposite margins.

Bevel : In this type the burin edge is prepared by detaching a vertical spall opposed to an oblique spall. The spalls are either single or multiple in number.

Rectangular : These are characterized by a transverse spall opposed to a vertical spall with an angular burin edge. The spalls are either single or multiple in number.

Concave : These are characterized by a concave spall opposed to a vertical spall.

Convex : In this type the burin edge is obtained by the opposition of a convex spall to a verticle spall with an incurved burin edge. The spalls are either single or multiple in numbers.

Unfinished : These two specimens are on nodules with cortex retained and the burin edge is not well defined; indicating the attempts of burin manufacture.

(d) BACKED PIECES (FIG. 18, NOS. 21-34; FIG. 19, NOS. 46-49)

These are the predominant variety of the blade-tools and reveal triangular, traphezoidal and sector-like (like an orange piece) cross sections. Those blades

with sector-like cross-sections show cross flaking on the dorsal surface and the ventral surface is flat with a single flake scar. These are characterized by minute blunting, coupled sometimes with secondary trimming on one side which is either steep or slanting. Blunting is generally present along the length on a convex or straight side. It is sometimes confined to the base or the tip region or both.

Blunting is done on blades producing convex-backs to give rise to knife blades and points; straight backs to make only points; and some of the thick blades are reduced to lunates and triangles. In the case of points with convex back the blunted convex side gradually curves up to meet the straight sharp side terminating in a point; while in those with straight backs both the sides gradually converge to a point. Out of 532 specimens, 353 are full-sized and 179 are broken. These backed blades represent 67.3% of the finished forms.

(i) *Points*

Convex back : Blunting is all along the length and the convex steep blunted side meets the unretouched straight or concave side terminating in a point.
Straight back : Unlike the above type these are more elongated with both the sides, one being blunted converging to a point.

Backed tip : These are characterized by steep as well as marginal blunting confined either only to the point or covering half of the length from the centre upwards.

Backed base : Such specimens which have a pointed tip but with an irregular base show blunting on the latter.

Backed base and tip : Some of the short stumpy and pointed blades are finished by just blunting at both the ends. The blunting at the tip is confined only to one margin.

(ii) *Penknives* : These are thick, massive and robust than the points, characterised by steep blunting all along the length which continues to the distal end.

(iii) *Lunates :* These are macro-to-micro in size and the blunting is generally confined to the arc. The chord in some cases is battered.

(iv) *Triangles :* Two are isosceles and the rest are scalene. The blunting is confined only to the two sides and the other side is sharp. Three specimens show battered marks.

(v) *Trapezes* : Blunting is present on three sides, the longer side remaining sharp. These are not as neatly finished as the lunates and triangles.

(vi) *Irregularly backed blades :* Blunting is irregular on three specimens and some of them are unfinished penknives and points. Two of them if finished might turn into transverse arrow heads.

(e) AWLS (FIG. 19, Nos. 35-36)

These are made mostly on flake and some are also on blade, core flake and core; characterized by delicate retouch on the dorsal surface at the point. The awl point in some cases is produced by a notch on either side. About five specimens reveal smooth abrasion indicating that these were used. The awl points represent 3.7% of the finished forms.

(f) POINTS (FIG. 19, No. 50)

These are made on flake, core and the finish is by bold retouch. These are considerably big in size and robust when compared to the backed points on blade. The flattening of the ridge on the dorsal surface and the thinning of butt ends might suggest that they were used as spear heads. One specimen has a tang. They represent 2.0% of the finished forms.

(g) BLADES (FIG. 18, NOS. 37-40; FIG. 19, NO. 51)

These are long and slender with one or more ridges on the dorsal surface, having sharp sides and no traces of retouch. These are pointed, parallel sided, irregular and shouldered. Some of the blades have battered margins indicating that they were used. Some others have a notch and a shoulder; and the latter might have been used after being inserted in a handle, probably a narrow cylindrical bone or wooden object. These represent 19.3% of the total collection. These are divided as follows.

(i)	Broken	440
(ii)	Full size :	
	Pointed (No. 37)	172
	Parallel sided (Nos. 38-39)	262
	Irregular (No. 51)	277
	Shouldered (No. 40)	199

Out of 765 full sized specimens 96 have battered margins indicating that they were used.

(h) PRIMARY FLAKES (Fig. 18, No. 41)

These are the primary removals that were struck off during the initial preparation of the core for detaching the blades. The flake scars on their dorsal surfaces are deep as well as shallow and irregular as well as convergent often retaining a patch of cortex. Those flakes with convergent scars in no way differ from those splintered off by the prepared core process. Out of 102

speciments about 14 have battered edges. These amount to 2.65% among the other categories.

(i) FLAKES (Fig. 18, No. 42)

These are triangular; irregular; and more or less parallel sided (flake-blade) in out line, exhibiting convergent and parallel flaking on the dorsal surface. Out of 215 pieces, 31 show signs of use. These represent 5.45% among the other categories.

(j) CORE FLAKES (Fig. 18, No. 43)

These are thick, parallel sided as well as irregular with more than two parallel mid-ridgers on the surface; produced by splitting the refuse cores into two or more pieces, when the parent core is fully exhausted. Out of 379, 33 have some kind or the other of signs of use. A few of these pieces with use-marks might have served the purpose of spoke shaves. These represent 9.57% among the other categories.

(k) CORES (Fig. 18, No. 44; Fig. 19, Nos. 52-55)

These are grouped according to the nature of the platform as follows. These amount to 4.74% among the other categories.

Single platform, Partial (No. 52)	51
Single platform, Whole perimetre (No. 44)	54
Two platforms; parallel (No. 53)	19
Two platforms; at right angles (No. 54)	16
Irregular (No. 55)	51

Single Platform, Partial : The platform is only at one end and blade scars are not continuous along the circumference but only cover a major or half the portion of the core.

Single platform, Whole perimetre : These are cylindrical and conical in shape with blade scars all around the perimetre. One specimen is of interest since it clearly indicates the primary preparation of the core; and a reference has been made earlier to this in explaining the technique of blade production.

Two platforms, Parallel : These are characterized by two platforms at both ends, either flat or oblique. The blade scars from both ends superimposed on each other indicate that the blades are detached from each end alternately.

Two platforms, at right angles : The direction of blade scars from their respective platforms is at right angles to each other. The nature of blade scars suggest that short and thin blades are removed from these cores.

Irregular : The negative scars of these shapeless cores suggest that bladish-flakes are detached from these cores.

(i) CHIPS

These are small splinters and irregular pieces that flew off during the primary dressing, core-rejuvanation and while detaching the blades. Apart from 1273 pieces included in the collection, 1864 pieces—of which 428 belong to NGL (B); 443 to NGL (C), and 993 to NGL (D)—are rejected on the site. These represent 77.5% among the other categories.

THE LATE STONE AGE INDUSTRY

The Late Stone Age industry is non-geometric and non-pottery in nature and consists of tools made on blade and flake. This occurs on the surface on the eroded first aggradational terrace along the river banks (Vedullacheruvu, Localities 1, 3 and 6) and slightly away from the main-course of the river at Aallagundlu. At Vedullacheruvu Localities 1 and 3, the Late Stone Age Industry occurs exclusively; and at Vedullacheruvu locality 6 and Nallagundulu artifacts of the blade-and-burin industry also occur in the vicinity. It was easy to isolate this industry since it is made exclusively on milky quartz (as confirmed at Localities 1 and 3) and at Nallagundlu the blade-and-burin industry made on fingrained quartzite is found in its pure form eight inches below the surface Late Stone Age horizon. When compared to the preceding blade-and-burin industry this poses an inferior look in all technological aspects. Whether this is due to the raw material—being milky quartz that flakes of indifferently—or it suggests a cultural decline as witnessed in the European Azilian and Tardenosian is yet difficult to postulate. The predominant tool type is the backed point and the others such as scrapers, awls, burins etc. stand next.
The industry comprises 1834 specimens of which (1) 468 belong to Vedullacheruvu Locality 6; (2) 547 to Vedullacheruvu Locality 3; (3) 183 to Vedullacheruvu Locality 1; (4) 368 to Nallagundlu; (5) 53 to subsquare A; (6) 78 to subsquare B; (7) 73 to subsquare C; and (8) 64 to subsquare D.

In the total collection the finished forms represent 11.2% and the other categories represent 88.8%. The length, breadth/length (B/L) and thickness by breadth (T/B) of the 766 full size specimens (leaving the broken artifacts and chips) are calculated which are summarized below.

The length of the specimens varies from 11 to 60 millimetres; the greatest number (30.0%) fall in the length class of 21 to 25 millimetres. The B/L index varies from .11 to 1.00; the greatest number (11.6%) fall between .46 to .50. The T/B index varies from .11 to 1.00; the greatest number (12.61%) fall between .36 to .40.

The industry is divided into the following categories :

FINISHED FORMS :

(a)	Scrapers	..	25	
(b)	Awls	..	24	
(c)	Burins	..	16	
(d)	Tanged points	..	7	
(e)	Points on core	..	10	
(f)	Backed pieces	..	121	Total 203 (11.2%)

OTHER CATEGORIES :

(g)	Flakes	..	331	
(h)	Blades	..	232	
(i)	Cores	..	104	
(j)	Chips	..	964	Total 1631 (88.8%)

(a) SCRAPERS (Fig. 20, Nos. 1-4)

Fifteen are on thick flake; eight are on core flake, and two are on core. Out of twenty-specimens, twenty are side scrapers and five are end scrapers. Retouch is confined to the cutting edge, mostly unifacial and less prominent. Eight of the side scrapers that are on core flake have one sharp side while the other is thick, steep and blunted. Three other side scrapers have a notch which is neatly retouched. Scrapers represent 12.36% of the finished forms.

(b) AWLS (Fig. 20, Nos. 5-6)

These are made on broad thick flakes. Some of the specimens are neatly finished, the awl being produced by a notch on either side which is delicately retouched. Retouch on the other specimens is less prominent. These comprise 11.8% of the finished forms.

(c) BURINS (Fig. 20, Nos. 7-9)

These are on thick flakes with the burin facet on only one end. Their finish when compared to those of the preceding blade-and-burin industry is highly inferior. Out of sixteen, five are of the central type; ten fall under bevel type and one is rectangular according to the classification of Noone (1935 : 81-92). Burins amount to 7.8% of the finished forms.

(d) TANGED POINTS (Fig. 20, Nos. 10-11)

These are unifacially worked and the base is finished into a tang by a notch on either side. In the case of one specimen the base is shouldered by means of a notch one side and step flaking on the other. Two are made on thin flakes; one on a thick core flake; two on thick flake and two on blade. These form 3.44% of the finished forms.

(e) POINTS ON CORE (Fig. 20, Nos. 12-13)

All are on thick cores, with unifacial dorsal retouch in the case of two specimens and bifacial in the remaining eight. The retouch extends from the base on either side tapering into a point. These are relatively massive and thick when compared to the tanged points. These amount to 4.82% of the finished forms.

(f) BACKED PIECES (Fig. 19, Nos. 14-15, Fig. 19, Nos. 16-27)

These are backed blade tools which are diminutive in size. The predominant variety is the backed point and the others include lunates and triangles. These are classified as follows. These represent 59.83% of the finished forms.

(i)	Points			
	Type A	(Nos. 14-16)	..	31
	Type B	(Nos. 17-19)	..	9
	Type C	(Nos. 20-22)	..	16
(ii)	Lunates	(Nos. 23-25)	..	44
(ii)	Triangles	(Nos. 26-27)	..	17
(iv)	Backed blades		..	4

(i) *Points*

Type A : These have a steep retouched convex side with a round or horizontal base, well defined point and sector like cross-section.

Type B : These resemble in shape the type A forms excepting that the retouch on the steep side is confined upto half the length from the base and the pointed end is unretouched.

Type C : These are irregular in shape when compared to the above types and the retouch is confined to one side of the pointed end. There are two specimens which are blunted obliquely at the anterior end.

(ii) *Lunates* : These are blunted only along the arc.

(iii) *Triangles* : Six are isosceles and the rest are scalene; blunting being confined only to two sides.

(iv) *Backed blades* : These are thick, relatively long and irregular with blunting all along the length on one side, terminating abruptly at the anterior end.

(g) FLAKES (Fig. 19, Nos. 28-29)

These are thick, as well as thin and their dorsal surface are characterized by irregular, convergent and/or parallel flaking. A few of them retain a patch

of cortex. Some are triangular and pointed with sharp sides which need no further retouch. These represent 20.2% among the other categories.

(h) BLADES (Fig. 19, No. 30)

These are small in sizes, not well defined as those of the preceding blade-and-burin industry. All are parallel sided, but their dorsal surfaces show irregular flaking. These amount to 14.2% among the other categories.

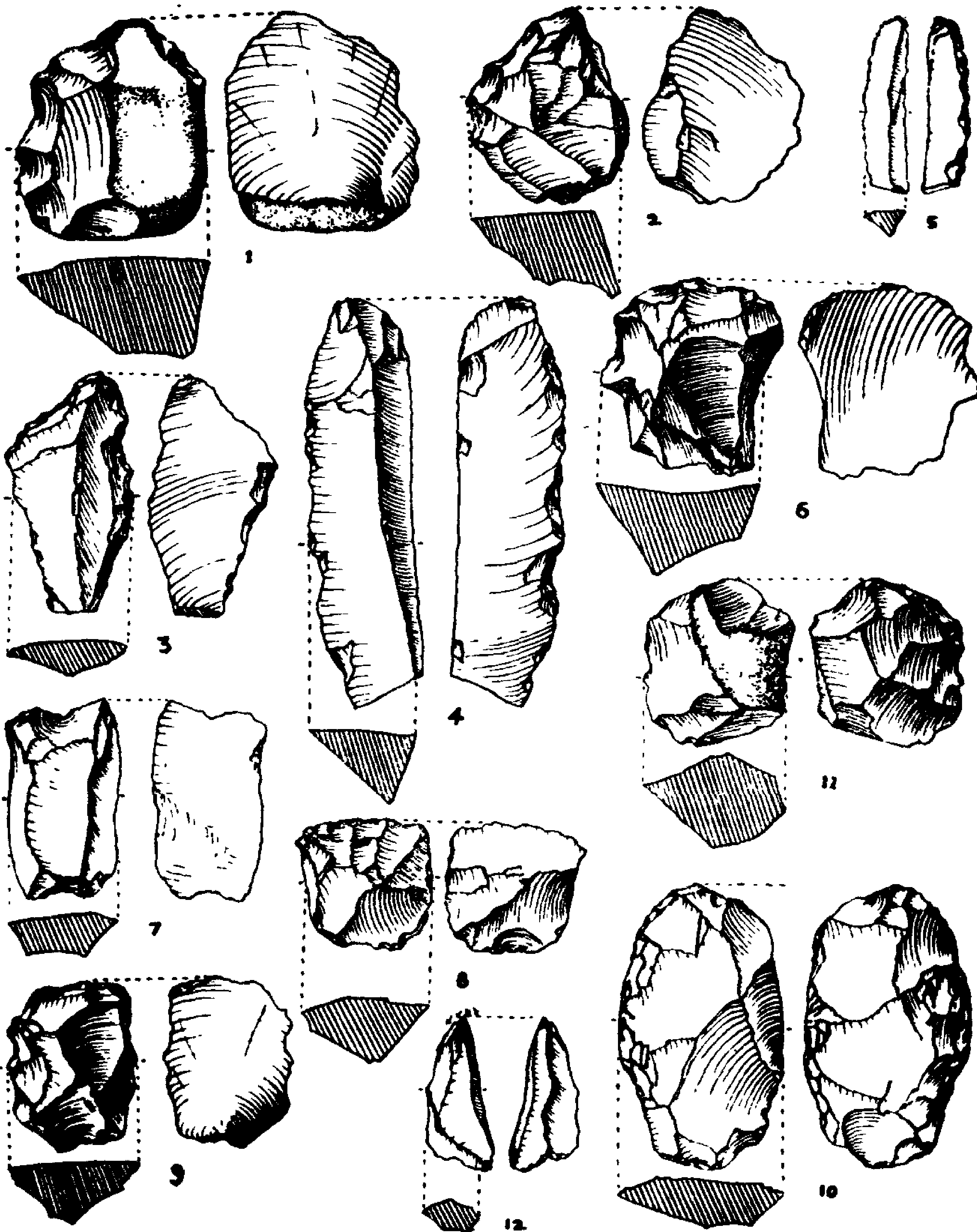


Fig. 17

(i) CORES

Out of a total of hundred and four, thirty-one are blade cores and the remaining seventy-three are flake cores. None of them have faceted platforms. These represent 6.4% among the other categories.

(j) CHIPS

These are the pieces that splintered off during the detachment of flakes and blades. These represent 59.2% among the other categories.

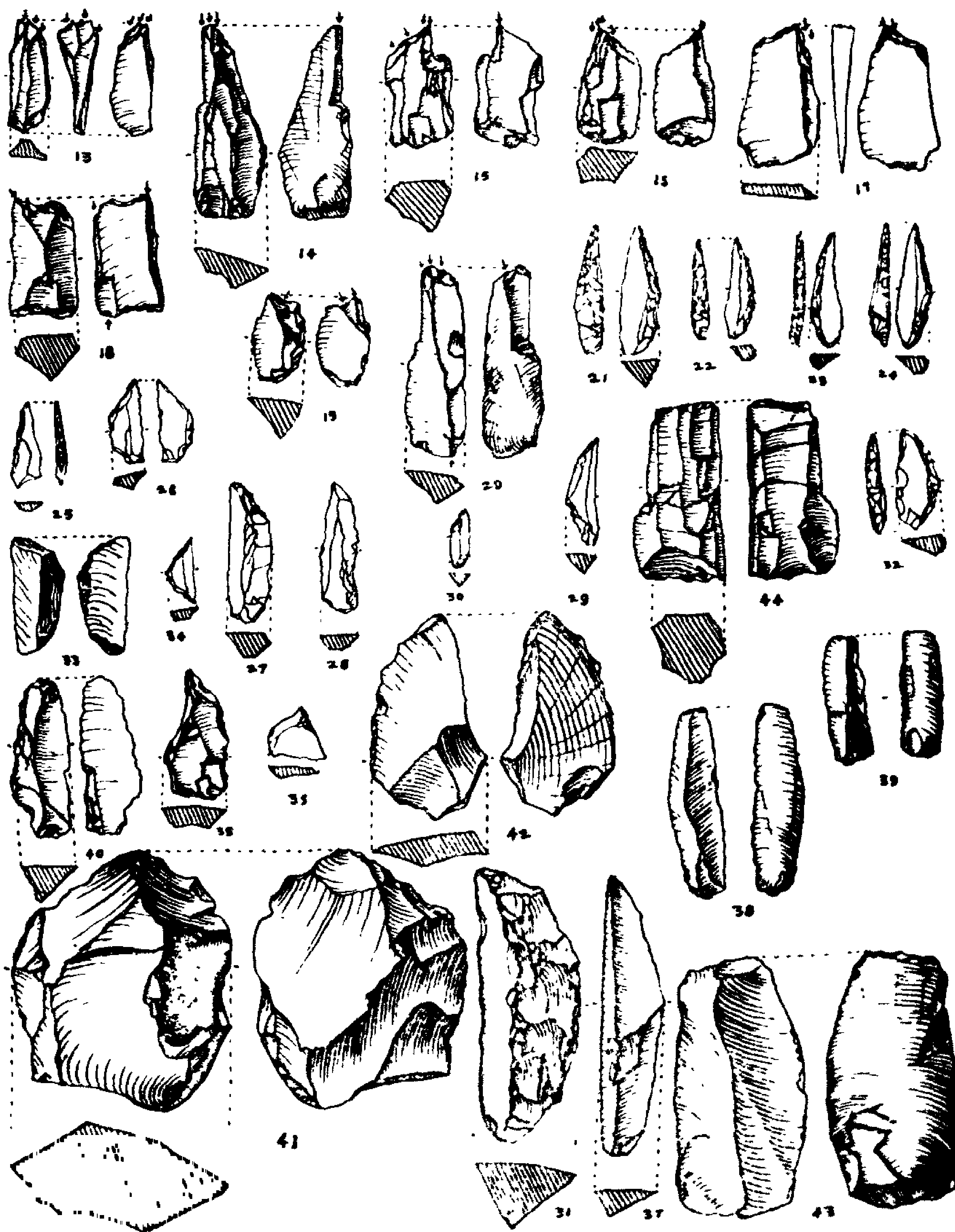


Fig. 18

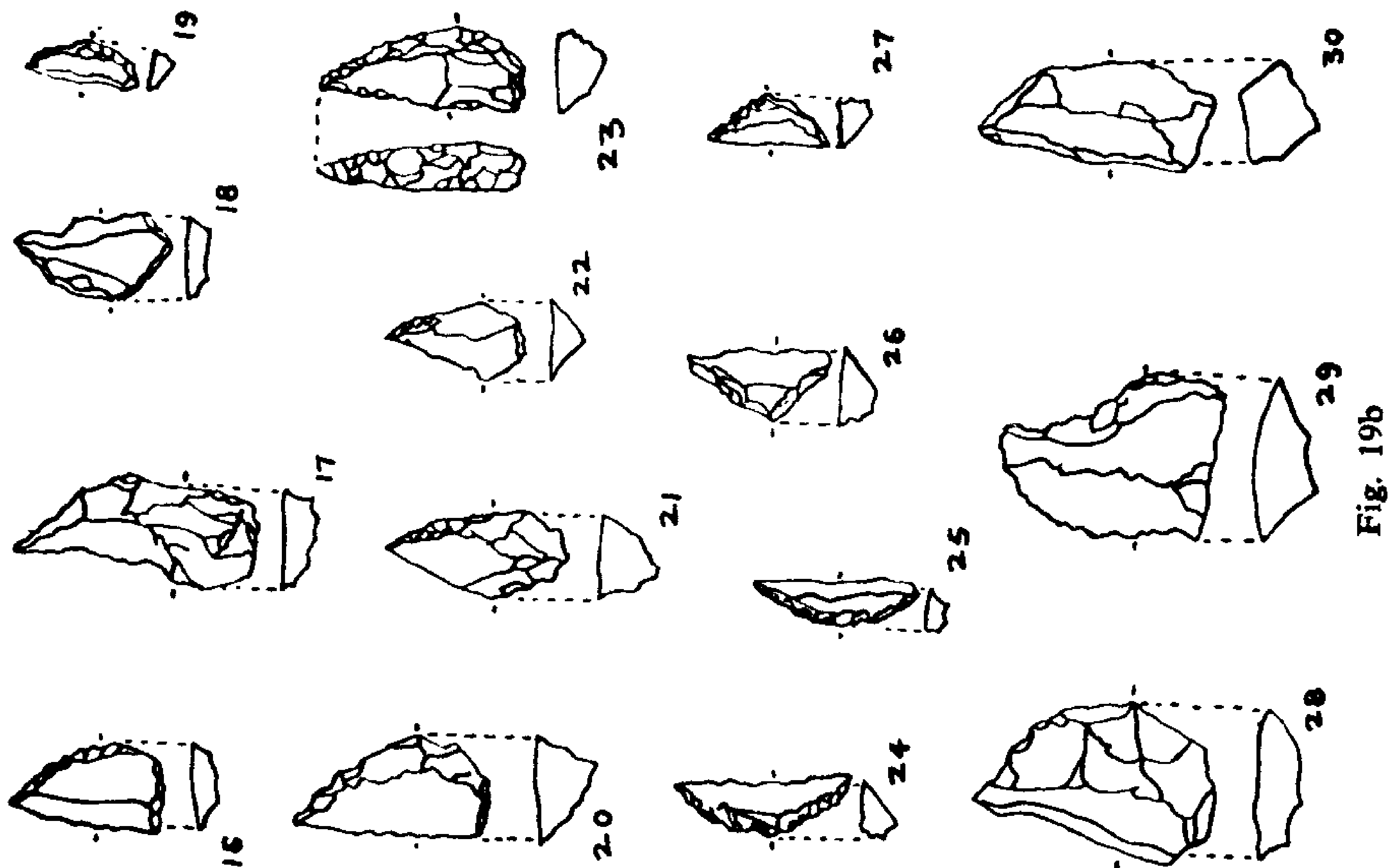


Fig. 19b

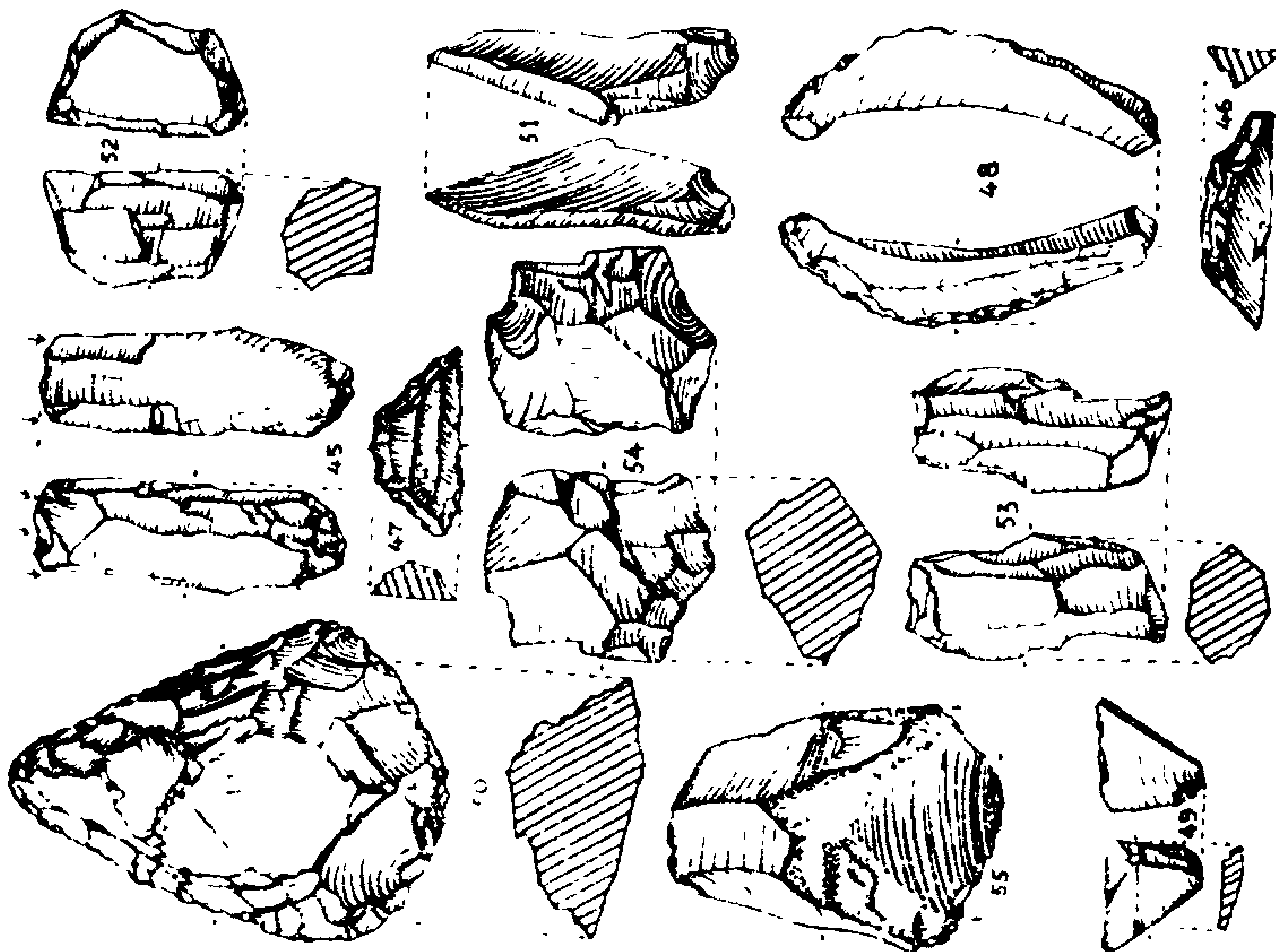


Fig. 19a

SUMMARY AND CONCLUSIONS

The blade-and-burin and the Late Stone Age industries from around Renigunta are based on the manufacture of implements on blades although flake tools are common. The implements of the former are neatly finished with backed blade tools and burins (among the finished form) forming a major

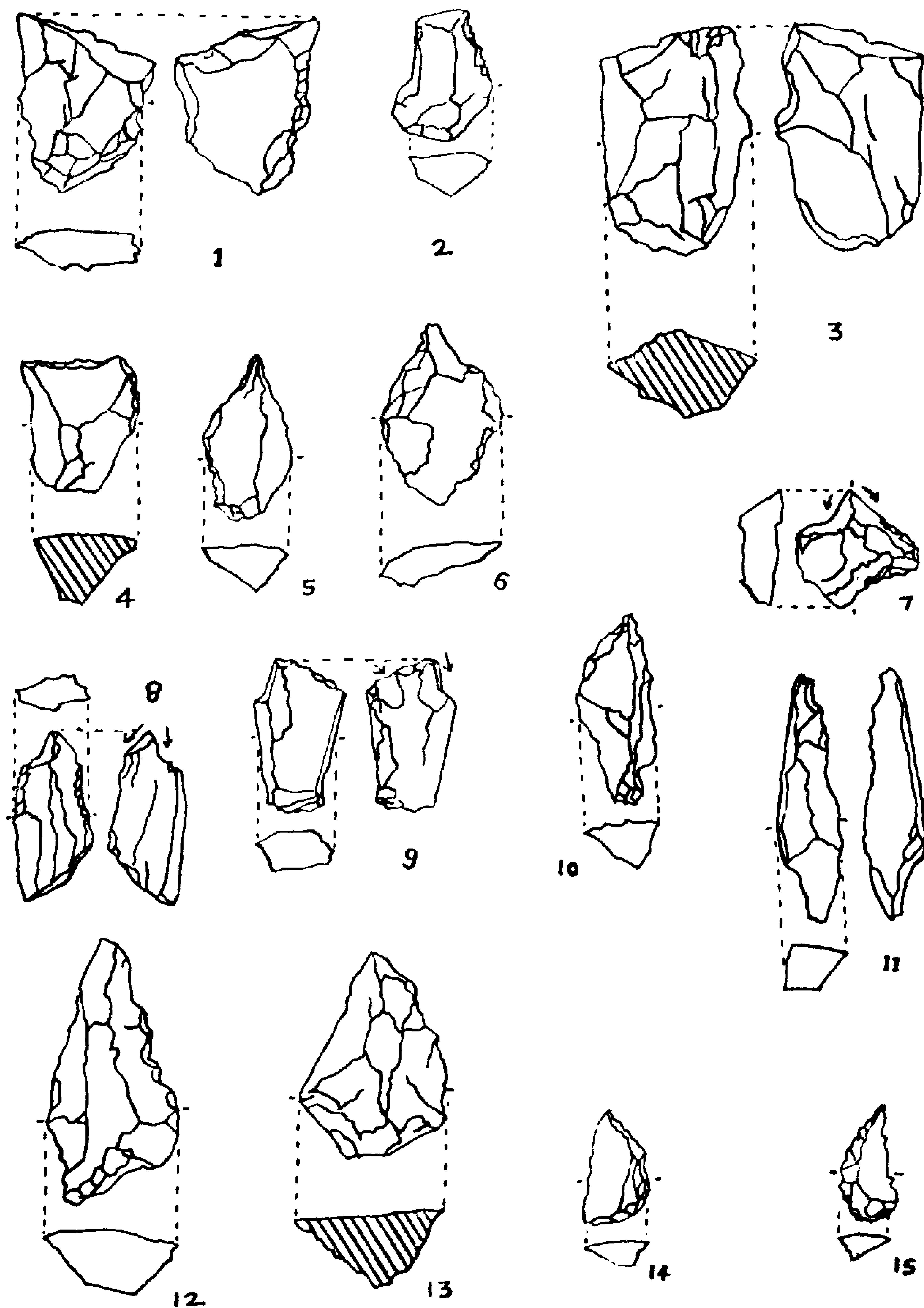


Fig. 20

component; while those of the latter look inferior with only the backed blade tools having a good representation. Both the industries differ in raw material which is fine grained quartzite in the blade-burin industry and quartz in the Late Stone Age industry. The great difference is in their size, being diminutive in the latter.

TABLE ONE : A Contrative Study of the Blade and burin (BBI) and Late Stone Age (LSA) industries showing the relative variation in length, breadth / length and thickness / breadth indices.

(a)

Length Index 1 (in mm)	BBI* (%)	LSA (%)
11–15	1·650	13·750
16–20	4·350	29·700
21–25	6·150	30·000
26–30	11·800	15·780
31–35	14·300	7·375
36–40	16·400	2·740
41–45	14·800	0·131
46–50	10·000	0·393
51–55	7·000	—
56–60	4·350	0·131
61–65	3·600	—
66–70	1·550	—
71–75	1·120	—
76–80	0·930	—
81–85	0·320	—
86–90	0·460	—
91–95	0·360	—
96–100	0·180	—
101–105	0·320	—

* Please Note : There are five more Specimens four of which representing 0·180% having length Index of 120 and the remaining one representing 0·049% with a length index of 180.

(b)

B/L Index	BBI* (%)	LSA (%)
·11– ·15	0·460	0·525
·16– ·20	2·550	0·525
·21– ·25	7·200	2·100
·26– ·30	11·000	5·500
·31– ·35	12·200	6·800
·36– ·40	13·300	8·720
·41– ·45	10·500	9·800
·46– ·50	9·500	11·600
·51– ·55	7·600	9·560
·56– ·60	6·260	9·300
·61– ·65	5·100	8·720
·66– ·70	3·700	7·420
·71– ·75	2·700	4·450
·76– ·80	2·350	3·660
·81– ·85	1·550	2·880
·86– ·90	1·100	4·060
·91– ·95	0·930	1·310
·96–1·00	1·000	3·140
1·01–1·05	0·320	—
1·06–1·10	0·138	—
1·11–1·15	0·320	—

* Please Note : There are six more specimens each representing 0·046% having B/L Index of 1·20; 1·25; 1·30; 1·40; 1·50; and 2·25, respectively.

(c)

T/B Index	BBI* (%)	LSA (%)
·11– ·15	0·230	0·393
·16– ·20	1·690	2·268
·21– ·25	4·600	4·840
·26– ·30	6·800	7·350
·31– ·35	9·140	9·300
·36– ·40	10·450	12·510
·41– ·45	10·650	11·800
·46– ·50	12·500	10·014
·51– ·55	7·700	7·050
·56– ·60	8·500	9·000
·61– ·65	5·150	6·140
·66– ·70	5·600	6·820
·71– ·75	5·050	3·530
·76– ·80	3·500	2·740
·81– ·85	2·500	1·965
·86– ·90	2·100	1·700
·91– ·95	1·820	1·301
·96–1·00	1·240	1·310
1·01–1·05	0·180	—
1·06–1·10	0·320	—
1·11–1·15	0·046	—
1·16–1·20	0·138	—

* Please Note : There are two more specimens each representing 0·046% having T/B Index of 1·25 and 1·55 respectively.

In the length index [Table 1 (a)] of the blade-and-burin industry there is a progressive increase in the percentage of specimens from the class of 16-20 mm to 36-40 mm where they represent the maximum (16.4%) and there is a gradual decline from the latter to the class of 61-65 mm to some significant extent and further down with less significant representation upto the class of 116-120 mm. (Please note : the representation is treated as significant if it is 2.0% or more and less significant when it is less than 2.0%). Where as in the Late Stone Age industry the increase is from the class of 11-15 mm to 21-25 mm., the maximum representation (30.0%) being in the latter followed by a gradual but significant decline upto the class of 36-40 mm. and still further upto 56-60 mm. with less significant representation. The difference in the length of the specimens of both the industries is strikingly apparent when they are sorted out into groups with a length range of 30 mm. (i.e. 11-30 mm., 31-60 mm., 61-90 mm., and 90-120 mm.). Thus while the specimens falling in the group of : (1) 11-30 mm. of the blade-and-burin industry represent 23.95%, those of the Late Stone Age represent 89.23%; (2) 31-60 mm. of the blade-and-burin industry represent 66.85%, those of the Late Stone Age represent 10.77% and (3) there are no specimens measuring beyond 60 mm. in the Late Stone Age while in the blade-and-burin industry 8.12% fall in the groups of 61-90 mm., 1.04% in the group of 91.120 mm., and 0.946% (single specimen) measures upto 180 mm.

In B/L index [Table 1(b)] of the blade-and-burin industry the representation is on the increase from the index class of .16-.20 reaching maximum (13.3%) in the class of .36-.40 with a significant decline upto the class of .76-.80 and less significant upto the class of 1.11-1.15. In the Late Stone Age industry the increase is from the class of .21-.25 with the maximum (11.6%) in the class of .46-.50 and the gradual significant decline continuing upto the class of .96-1.00. When these are sorted out into groups with a range of index value of 0.30 (as has been done in the case of length index) those falling in the group of (1) .11-.30 of the blade-and-burin industry represent 21.21% while those of the Late Stone Age represent 8.65%; (2) .31-.60 of the blade-and-burin industry represent 59.36% while those of the Late Stone Age represent 55.72%; (3) .61-.90 of the blade-and-burin industry represent 16.45%; while those of the Late Stone Age industry represent 31.19%; and (4) .91-1.2 of the blade-and-burin industry are 2.746% while in the Late Stone Age industry 4.45% fall in the group of .91-1.0. In the blade-and-burin industry an additional 2.3% vary in B/L index value from 1.25 to 2.25. The B/L index is found to increase with relative increase of breadth in proportion to length.

In T/B index [Table 1 (c)] of the blade-and-burin industry the increase in the percentage of specimens is from the class of .21-.25 reaching the maxi-

mum (12.5%) in the class of .46–.50 followed by a gradual but significant decline upto the class of .86–.90 and further less significant upto the class of 1.16-1.20. In the Late Stone Age industry the increase is gradual from the class of .16–.20 reaching maximum (12.51%) in the class of .36–.40 followed by a significant decline upto the class of .76–.80 and further less significant upto the class .96–1.00. When these are sorted out into groups with a range of index value of 0.30 those falling in the group of : (1) .11–.30 of the blade-and-burin industry represent 13.32% while those of Late Stone Age represent 14.85%; (2) .31–.60 of the blade-and-burin industry represent 58.94% while those of the Late Stone Age represent 59.674%; (3) .61–.90 of the blade-and-burin industry represent 23.9% while those of the Late Stone Age industry represent 22.89%; and (4) .90–1.2 of the blade-and-burin industry represent 3.744% while in the Late Stone Age they end with the class of .90–1.00 with a representation of 2.62%. In the blade-and-burin industry, in addition there are two more specimens each representing 0.046% with an index value of 1.25 and 1.55, respectively. The fact that the T/B indices of the both the industries is more or less parallel explains that the proportion of thickness to breadth in both the industries is relatively uniform.

The implements of the blade-and-burin industry claim some unique characters in so far as the analogies to those at home and abroad are concerned; while those of the Late Stone Age fit into the general pattern that is characterized by earlier aceramic non-geometric facies.

For an understanding of these characters of the blade-and-burin industry in this region a brief comparison of this industry to the others within-and-outside the country would be of great help. To begin with blade-and-burin or flake blade industries referred to as Upper Palaeolithic-or-like are known from a few centres spread over various parts of the country. These industries either stratigraphically succeed the Middle Stone Age or occur loose on the surface. Taking into consideration, on the one hand, their stratigraphical succession to the Middle Stone Age (wherever available) and on the other their typological similarities to the Upper Palaeolithic forms in other parts of the world these were labelled as Upper Palaeolithic-or-like. These industries in various parts of the country display typo-technological differences among themselves indicating a heterogeneous culture growth after the middle Stone Age times.

The industries known from (1) Dhekulia, Palmau district, Bihar (Ghosh *et al* 1965—66 : 163; (2) Janekpur and Jhansighat near Hoshangabad and Narsingpur on the Narmada in Madhya Pradesh (De TERRA and PATERSON 1939 : 320); (3) Maheswar also in Madhya Pradesh (Sankalia *et al* 1958 : 37-41) are characterized by tools made predominantly on flakes and flake-blades. The industry from (1) succeeds the Middle Stone Age stratigraphi-

cally. These industries mostly comprise scrapers, points etc. and although blades occur in varying degrees finished tools on blades and burins are meagre.

The industries from (1) Bariyari, Banda district (SHARMA 1955-56 : 4) and on the Belan in Allahabad district, (SHARMA 1967), both in Uttara Pradesh : (2) Singbhum in Bihar (GHOSH 1965 : 49) ; (3) Nevasa in Maharashtra (SANKALIA 1960 : 5) ; on the Banjer in Madhya Pradesh (SEN 1960-61 : 60) ; and (5) in Shorapur Doab, Mysore State (PADDAYYA 1968 : 68-89) have a good representation of blades and blade tools along with those on flakes and flake blades. The industries from (1) succeed the Middle Stone Age stratigraphically, and they are in such a context where there is a continuous cultural succession and the discoverer opines that they suggest a transformation from Middle Stone Age through the blade-and-burin industry to the microlithic. Though finished blade tools and a few burins form a component of these assemblages, scraper tool types however predominate.

The industries known from (1) Reingunta, Chittoor district, Andhra Pradesh comprising the present collection that also includes the previous collection (MURTY 1966; 1969) and (2) Kurnool in Andhra Pradesh (ISAAC 1960; Thimma REDDY 1969 : personal communication) qualify to a great extent the Upper Palaeolithic standards than the others known to date, in this country. These are characterized by the profuse occurrence of simple blades and backed blade tools such as points, lunates, a few triangles and trapezes and well defined burins with chisel edged burin ends. Scrapers and other flake tools are also common.

The industries reported from (1) in-and-around the vicinity of rockshelters containing paintings at Basauli and Lekhania, both in the Mirzapur district of Uttara Pradesh (SHARMA 1956-57 : 11, 14-15; Pl. VIII) ; (2) in the vicinity of several rock shelters at Mori, Mandosar district, Madhya Pradesh (DIKSHIT 1957-58 : 26-27) ; and (3) Nagarjunakonda, Guntur district, Andhra Pradesh (SOUNDRA RAJAN 1958 : 49-113) though consist of blades and backed blade tools they are diminutive in nature recalling the Late Stone Age forms.

The present collection from around Renigunta has its own distinctive features in having large size blades and blade tools and robust burins when compared to the above mentioned industries excepting those of Kurnool. None of these other industries have, either in quality or quanity, burins, massive as well as short sized retouched blade tools, macrolunates and triangles and beautifully finished end scrapers found in the sites around Renigunta. Any other similarities that can be noticed at random are confined to the backed blades. The recently discovered industry at Yerragondapalem by THIMMA REDDY (1969) is most akin to those of Renigunta than the others mentioned earlier.

The parallels displayed by the implements of the Renigunta blade-and-burin industries to those outside the country are restricted only to some types such

as backed blade tools, burins and a few scrapers on blades and flakes. The analogies cannot, however, be drawn specifically to a particular phase of the Upper Palaeolithic abroad, since here, or for that matter anywhere, in the Indian subcontinent is absent a parallel Upper Palaeolithic manifestation with many subdivision as one finds in Europe, Africa and West Asia. At any rate the burins are most akin to those that occur in the Aurignacian and Magdalenian; Upper Aurignacian of the Linsenburg in Germany; Grimladian of Italy; Antelian of the Levant; Kostenki II, III and IV and Borshova II of the U.S.S.R.; and the Dabban industry at Hagfet-ed Dabba and the Menchian near the centre of Kom Ombo plains in North Africa. The straight-back and curved back blunted points and the end scrapers on blades recall the Chatelperronian and Gravettian types.

Taking into consideration the hetereogeneous development of the Upper Palaeolithic like industries in this country and keeping in view the similarities displayed by the tools types of this industry to those abroad rather than to those at home it has been suggested elsewhere (MURTY 1969) that these industries around Renigunta have an independent origin. Now, coupled with the new evidence from Yerragondapalem it can be tentatively suggested that the south-eastern and western Andhra Pradesh rich in quartzite formations of the Cuddapah and Kurnool series might represent a microgeographical cultural sub-area in this country which is a great cultural area.

Looking at the Late Stone Age industry from this region it can be only said that it is in agreement with the earlier aceramic non-geometric facies of the country in general and with that of the southern peninsula in particular, made on quartz which is one of the chief raw materials in this part of the country. It however, falls short of certain traits encountered in the neighbouring zones such as the transverse arrow heads of the Tinnevelly Teri sites from Madras (ZEUNER and ALLCHIN 1956 : 4-20) and Mysore (SESHADRI 1956) and the beautifully finished tanged points of the Kurnool industries (ISSAC : 1960). When compared to those outside the country the microlithic component can be paralled to those in Europe, Africa and West Asia while a majority of the mesolithic traits are unaccounted for.

The absence of any datable evidence makes it difficult to fix these industries in the chronological framework. However, a guess of the tentative time limit can be attempted on relative grounds. SANKALIA (1962 : XXI) taking into consideration some of the earlier non-geometric industries from Tinnevelly, Mysore, Birbhanpur and the relatively well advanced industry of Langhnaj (which is associated with Mesolithic traits) has rightly suggested a date of *c.* 5000 B.C. for the beginning of Late Stone Age. The carbon 14 determinations placed the earlier phase for the industry at Langhnaj at the age of 2500 B.C. and the later at 1500 B.C. and since this industry is much advanced they cor-

roborate the date suggested by SANKALIA for the beginning of Late Stone Age. There is yet another Mesolithic settlement at Bagor in Rajasthan (MISRA 1969) with advanced industry whose earlier levels have been dated to about 3800 B.C. (MISRA : Personal communication) by the carbon 14 method. Since this industry is also typologically advanced with geometric component when compared to those of Tinnevelly, Mysore and Birbhanpur it adds further weight to the date of *c.* 5000 B.C. for the beginning of the Late Stone Age. The earliest absolute date for the Mesolithic settlement in this country comes from Adamgarh in Central India (JOSHI 1968 : 245-54) which is 5,500 B.C. (obtained for shell samples from levels of 15-21 cms. in a total deposit of 150 cm.), Interestingly enough, the stone industry here, in accordance with its earliest date, compares to the blade-and-burin industries around Renigunta, to some extent in size and to a great extent in typology as the former is also based on backed points and well defined burins. In view of these above facts it can be tentatively suggested that the blade-and-burin industries around Renigunta might be ascribed to a time limit of *c.* 8000 B.C. — *c.* 6000 B.C. As the late Stone Age industry in this region is in general agreement with the earlier non-geometric industries, it might be dated to *c.* 5000 B.C.

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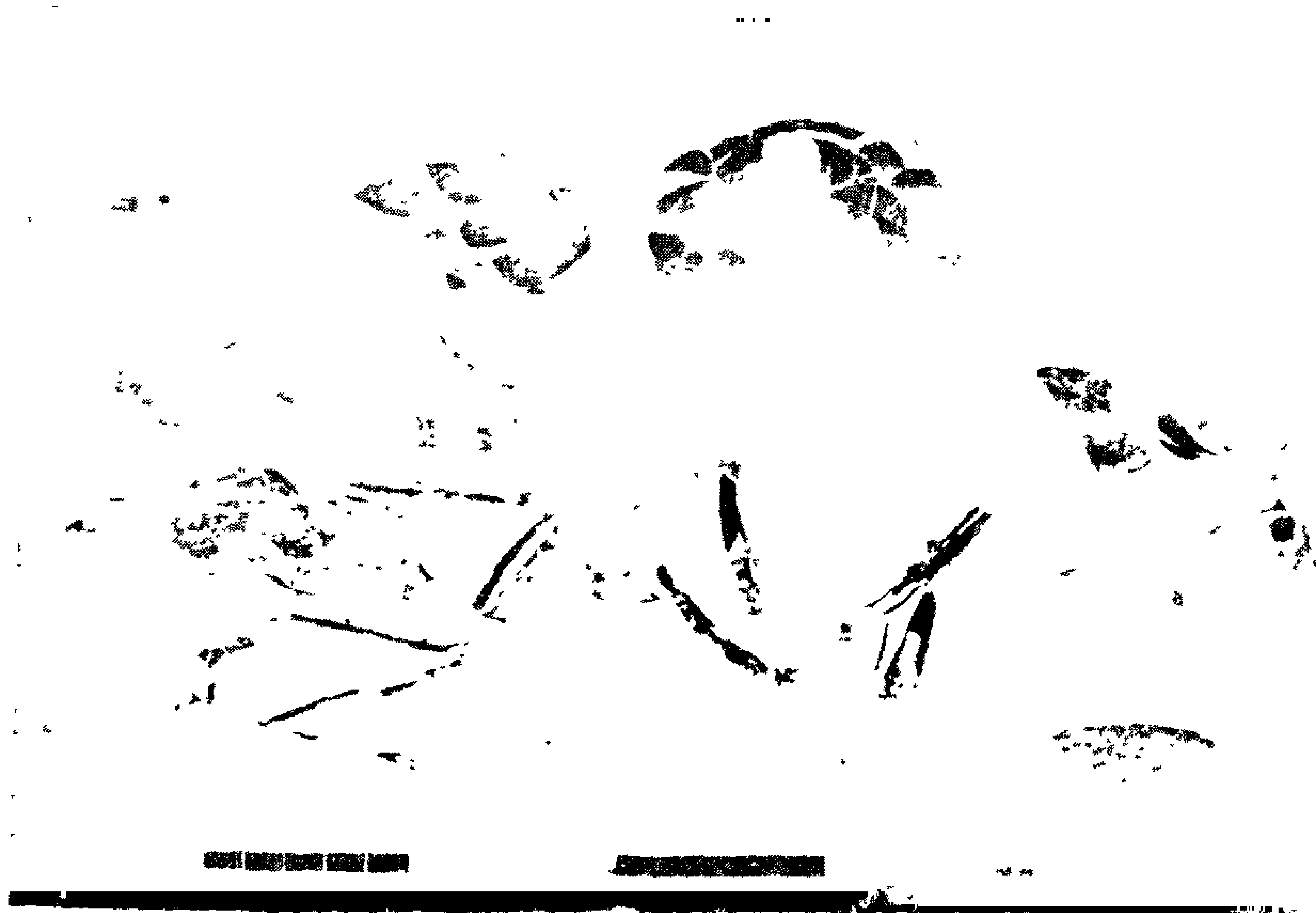
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Pl. IX : Burials from Bagor



a



b



c



d

Pl. Xa-d : Modern potter at work in Rajasthan

MODERN POTTERY IN MEWAR, RAJASTHAN*

By

MALTI NAGAR

THE USE of ethnographic data for understanding better the archaeological evidence, which is always incomplete, is as old as archaeological research itself. It is true that ethnographic evidence was sometimes uncritically used and therefore the usefulness of the procedure became suspect in many eyes. But of late there has been a revival of interest in the use of ethnographic evidence, and it is now being realized that, judiciously used, ethnographic evidence can be of great value in understanding the mechanism and processes of the functioning of now extinct cultures. This approach can best be seen in the recent writings of Prof. Grahame Clark.[1] In America, archaeologists are realizing the value of problem oriented ethnographic research by archaeologists themselves. As a result, a new branch of Archaeology called 'Action Archaeology' has come into existence.[2]

It was with this approach that the author undertook a study of the Ahar culture in Mewar. This pre-iron culture had flourished in southern Mewar in the second millennium B.C. While the type site of the culture is Ahar in the suburbs of Udaipur city, some fifty more sites are spread in the valleys of the Banas, the Berach and their tributaries eastward. Our investigation consisted of the examination of archaeological materials from Ahar and other sites on the one hand and of ethnographic material from villages in the vicinity of Ahar and other sites on the other. The two classes of evidence were finally brought together to find out (i) how far,if at all, the ethnographic evidence reflected the archaeological record and (ii) was useful in understanding the latter better. The present paper describes the ethnographic data on pottery making collected for the above study.

The field data on pottery was mainly collected in the village of Parla situated close to the ancient site of Ahar. This was supplemented by studies in the villages of Ahar, Chor Bavli, Eklingpura and Subhagpora, all situated within a radius of six kilometers of the mound of Ahar, and also from Kumharvada (Potter's locality) in the city of Udaipur. Similar studies were also made in the villages of Darauli, Gadariawas, Tarawat and Bansen, all of them situated on or close to Aharian mounds. Finally, pottery making was studied in the

* This paper is adapted from a chapter in author's Ph.D. thesis "The Ahar Culture: An Archaeological and Ethnographic Study," accepted by Poona University in 1967.

village of Gogunda, located some 25 kilometers to the west of Udaipur in the forested region of the Aravalli hills. This village has a large *kumhar* population, and is well known all over western Mewar for the quality of its pottery which is widely exported in the region.

The vessels used by the people of Mewar are made of clay, metal, wood and stone. The metal vessels are, however, used only by the richer sections of the society, and stone and wooden vessels are rare. The majority of the people use only clay vessels for most of their requirements. These are all locally made and therefore are likely to preesrve the ancieit pottery traditions in shapes and techniques. The present study is, therefore, restricted to clay vessels only.
On the basis of external appearance, clay texture, technique of manufacture and decoration, the pottery of the region may be divided into two basic wares, namely (i) Black ware and (ii) Red ware. The latter is again divided into two sub-wares, viz. (i) Slipped red ware, and (ii) Unslipped red ware.

The Black and Red Wares differ from each other mainly in the technique of firing. Vessels in Black ware are fired under reducing conditions where the oxygen is insufficient to burn the carbon and its compounds. In this process of firing, the pots become black or grey. In the case of Red ware on the other hand open kiln is used. It is an oxidising fire in which there is enough oxygen to cause a combustion of the gases and carbon particles in the kiln, and thus smoke is allowed to escape so that pots turn light red in colour. A proper circulation of air is very important in this process. The other important difference between the two wares is in the sphere of decoration. While Red ware vessels are decorated with painted designs, Black ware vessels are decorated with incised and applique design alone.

From the functional point of view the pottery of Mewar can be divided into the following five groups:

(1) Storage vessels.
(2) Cooking vessels.
(3) Eating and drinking vessels.
(4) Ceremonial vessels.
(5) Other vessels.

Some vessels occur more frequently in one ware while others are equally common to both wares. Thus, ceremonial vessels occur only in Red ware while cooking vessels occur only in the Black ware. Table I gives the relationship of the types to wares and the nearest English equivalent of the local type name in parenthesis and full description on the following pages.

Group I

Storage vessels are generally made in slipped red ware and are rare in Black

TABLE NO. 1.

Functional Group	Types	wares		
		Block were	Red were	
			Slipped	Unslipped
I. Storage	1. Matka (Big jar)	Rare	Very Common	Absent
	2. Matki (small jar)	Absent	Very Common	Absent
II. Cooking	1. Tawa (Platter)	Absent	Absent	Common
	2. Kelri or Bhanai (Deep pan)	Common	Common	Absent
	3. Handi (Small globular pot)	Common	Common	Absent
III. Eating ahd Drinking	1. Chhoti Kundi (Bowl)	Common	Rare	Absent
	2. Bari Kundi (Big bowl)	Common	Rare	Absent
	3. Tavni (Similar to Handi)	Common	Absent	Absent
	4. Chhota Kulka (Small globular pot.)	Common	Absent	Absent
	5. Kulki (Miniature pot)	Common	Absent	Absent
	6. Shakora (Tumbler)	Absent	Absent	Common
	7. Dhakni (Lid)	Very Common	Rare	Absent
IV. Ceremonial	1. Kulka (Elongated pot)	Absent	Absent	Common
	2. Kalash (Globular pot with several mouths)	Absent	Absent	Common
	3. Bujara (Special lid for Kalash)	Absent	Absent	Common
	4. Bujari (Pointed goblet)	Absent	Absent	Common
	5. Dubana / Dubani (Offeridg stand)	Absent	Absent	Common
	9. Jawario (Round sided bowl)	Absent	Absent	Common
V. vessels	1. Diyali (Lamp)	Absent	Absent	Common
	2. Ger (Bucket)	Absent	Absent	Common

ware. The vessels are made by a combination of wheel and hand methods and fall into two main shapes — (1) *Maṭkā*, and (2) *Maṭkī*.

(1) *Maṭkā* is a large, globular, broad mouthed pot with round belly and base. A variation of it has narrow mouth and slightly narrow neck and round base (Pl. XI,4). The vessel is used for fetching water and for storing water. and food grains. Both forms are made by a combination of wheel and hand.

(2) *Maṭkī* is a smaller version of *Maṭkā* and is either oval or deep and globular in shape. Some times it has an acute carination in the belly (Pl. X, 2) or mild carination at the shoulder. It is used for storage and for fetching water and is balanced over the *maṭkā* on the head of a woman while fetching water.

Group II

Cooking vessels, with one exception, are made only in Black ware and are never painted. The vesesls are mostly made by a combination of wheel and hand methods. There are three main shapes in this group, viz. (i) *Tawā*, (2) *Kelrī* and (3) *Haṇḍi*.

(1) *Tawā* is a shallow dish and is used as a platter for preparing *chapati*, and occurs only in unslipped red ware. It is entirely hand made and unpainted, except for an occasional single red band over or near the rim.

(2) *Kelrī* resembles *Tawā* but is deeper like a frying pan and is used for preparing *halwā, puree, etc.* It is found only in Black ware and is partly wheel and partly hand made. A variation of it is *Bhaṇaī;* it is highly burnished on both faces and has a beaded out rim which helps in lifting it up with hands from the oven.

(3) *Haṇḍī* is a small deep globular pot, very similar to *Maṭkī* in shape and technique of manufacture but different in function and fabric. It is used for cooking pulses, rice, *rābdī, Khichrī,* and other semi-liquid dished. It occurs in Black ware alone and its outer surface is burnished.

Group III

Eating and drinking vessels are made in Black ware as well as in both varieties of Red ware. The vessels in Black and Slipped red wares are burnished and decorated with incised designs on the shoulder or belly while those in unslipped red ware are never decorated. Some vessels are made entirely on wheel while others are made by both wheel and hand. There are seven principal types in this group.

(1) *Chhaṭi Kuṇḍī* is a small bowl and has two sub-types. The first has outgoing rim, tapering sides and flat base, while the second has more outgoing rim and flat ring base. Both sub-types are accompanied by a lid with tapering sides and a knob in the centre on the exterior. These are used for keeping curds

and other liquid foods and sometimes for eating and drinking *dal, lapi*, etc. These occur mostly in Black ware and only rarely in Red ware. They are turned entirely on wheel and are burnished but no decoration is applied to them.

(2) *Bari Kuṇḍi* is a big, shallow basin-like vesel with beaked-in rim, straight sides, sloping shoulders and round base. It is accompanied by a shallow, round-sided lid with a central knob on the interior or exterior. It is used for keeping *chapātī*. It occurs mostly in Black ware but sometimes in the Red ware as well and is partly wheel made and partly hand made. Both surfaces are burnished and the external surface is decorated with incised designs.

(3) *Tāvnī* has two shapes: one is a small globular vessel similar to *Haṇḍī* in shape but is highly burnished and occurs in Black ware alone. The other has flared rim, sloping shoulders, straight sides and round base and occurs more often in Red ware. It is accompanied by a lid with slightly concavo-convex sides and external knob. *Tāvnī* is used by women to carry liquid foods like *rābḍī, chhāchh*, etc. to their menfolk in the fields. The highly burnished specimens are used for storing *ghee* and butter. It is made by a combination of wheel and hand and is found only in Black ware. It is always burnished and sometimes bears incised and applique decoration.

(4) *Chhoṭā Kulkā* is a small, convex-sided pot with outgoing rim and is made in slipped red ware. It is used for taking out water from big *Maṭkā*. It is made on wheel and does not bear any decoration.

(5) *Kulki* is a small version of *Kulkā* and occurs in two shapes: one is small mouthed and globular and used for keeping *ghee* for daily consumption; the other is broad mouthed and slightly carinated and is used for keeping oil. Both these shapes occur in Black ware. They are wheel made and burnished.

(6) *Shakorā* has a broad, flaring mouth, featureless rim, tapering sides and flat base, and is used for drinking liquids. It occurs in Unslipped red ware only. It is entirely wheel made and has no decoration. It is discarded after being used once.

(7) *Ḍhāknī* is a dish-shaped pot and is used as lid. It is made in all the three wares and in three shapes: (a) with knob on the exterior, (b) with knob on the interior, and (c) without knob. These are entirely wheel made. No decoration is applied to them though sometimes burnishing is done.

Group IV

Ceremonial vessels are made in unslipped red ware and are painted. They are turned either on wheel or made by a combination of wheel and hand. There are six main types in this group.

(1) *Kulkā* is a more or less a *Hāndī-like* vessels but is less globular than *hāṇḍī* (Fig. 21,3) and is used together with a lid (Fig. 21,2). Among Brahmins and Kumhars it is used during *Bārvān* ceremony (which takes place on the twelfth day after death). It serves as a jar for serving *dal* or water into smaller vessels on the occasion of community meals. It is entirely wheel made and is never burnished or painted except for an occasional band over the rim.

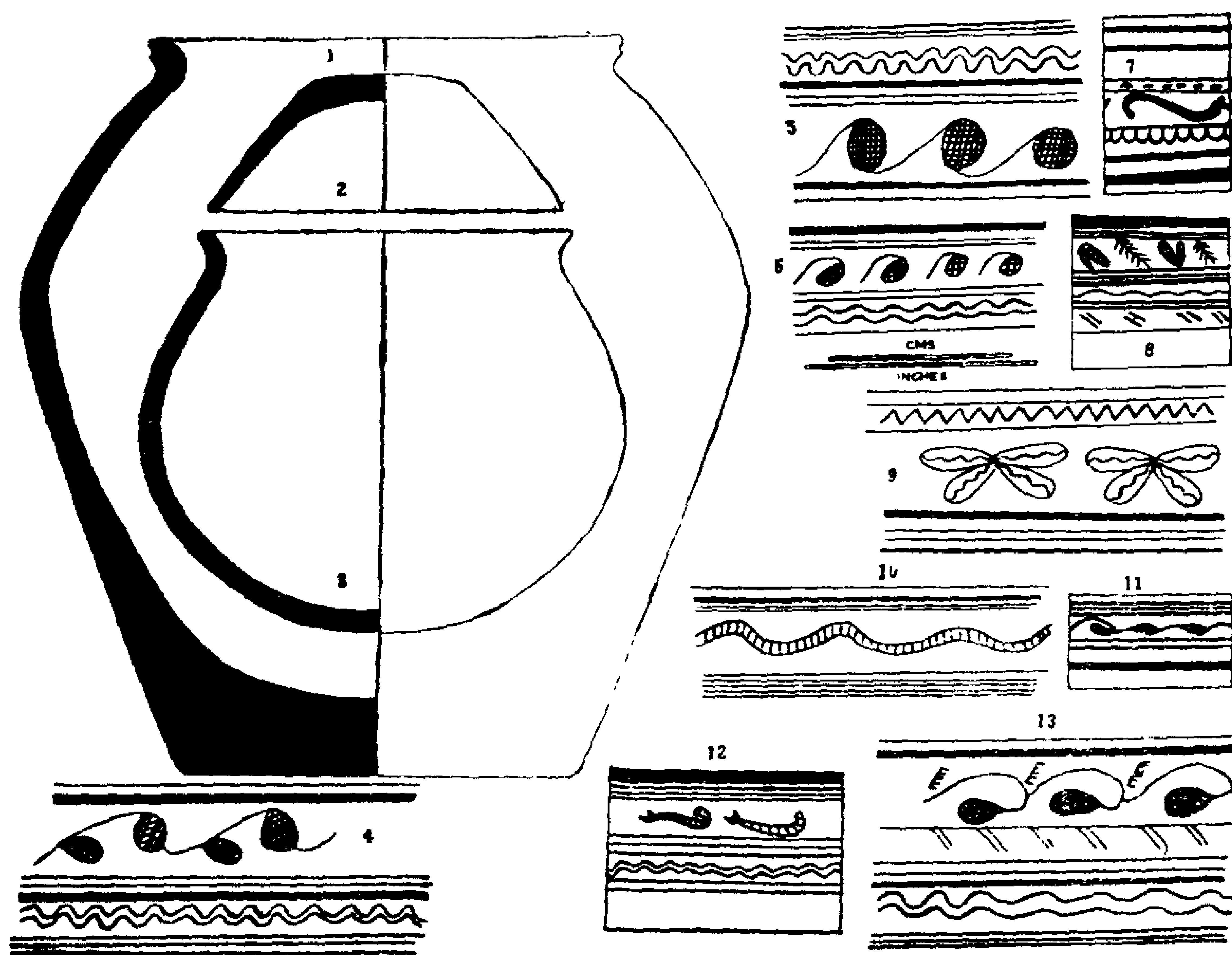


Fig. 21

(2) *Kalash* is a globular pot and is found in two shapes: one has several side openings on the shoulder and is called *Barā-Kalash* (Fig. 22, 1; Pl. XI, 3), the other is smaller and without side openings and is called *Chhoṭā-Kalash*. Both are associated with a single type of lid. *Barā-Kalash* is used in ceremonies connected with pilgrimage (*tīrtha-yātrā*). After returning from pilgrimage people sow barley in it and allow the seedlings to grow for nine days. On the tenth day the wife of the man who has completed *yātrā* takes the *Barā-Kalash* and goes to offer prayers to the gods on the outskirts of the village. The mouth of the *Kalash* is covered by a special type of lid called *Bujārā*. Normally a coconut isused for the purpose but when coconut is not available *Bujārā* is used instead. *Chhoṭā-Kalash* is used in dancing. Women balance seven of these pots on their head one above the other. Here the topmost *Kalash* is surmounted by a *Bujārā*. Both types of *Kalash* are made by a combination of wheel and hand, and are painted.

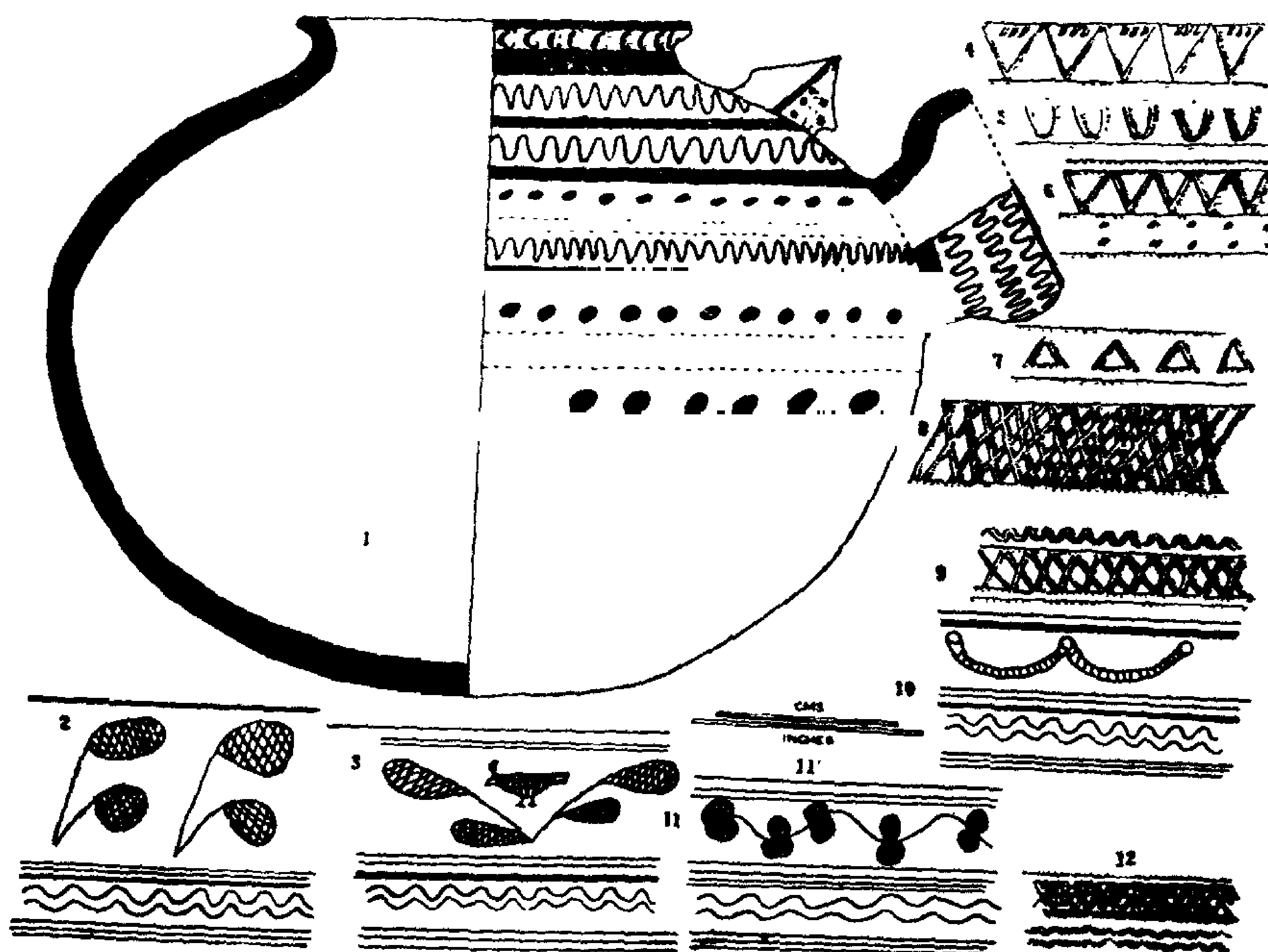


Fig. 22

(3) *Bujārā* is a small globlet with narrow mouth and pointed base and is placed on the *Kalash* in an inverted position to serve as a lid for the latter. Its maximum width lies in the centre from where the sides taper in two directions. The sides bear notches in the centre to help the lid fit well in the mouth of the *Kalash*. It is made on wheel and is painted.

(4) *Bujārī* is identical with *Bujārā* in shape but is smaller and has an altogether different function. When children are afraid of darkness or evil spirits this pot is heated in fire, and when red hot is dropped into a large pot filled with cold water. The immersion produces a loud sound and it is a popular belief that by hearing the sound the child's fear vanishes and the evil spirits depart. The vessel is made on wheel and has no decoration. This vessel is prepared only after sun-set on the fourteenth day after *Diwālī*.

(5) *Dubānā* is a small offering vessel in the shape of a bowl on stand. It is prepared in three sizes and is used for making offerings to spirits and deities. It is made on wheel and is painted. The smaller type is called *Dubānī*.

(6) *Jawārio* is a shallow bowl with sloping sides and is used for ceremonially sawing barley on the seventh day after the festival of *Holi*. Then during the *Gangaur* festival women carry this vessel on their head singing songs and throw it in a well. The vessel is made on wheel and is never decorated.

Besides, there are two more vessels which do not fall into any of the categories specified above. One of these is *Diyāli* and the other *Ger*. The former is in the shape of a small bowl with a flat bottom. It occurs in many sizes and is used both as a lamp and a lamp-shade. It is provided with three or four holes near the edge at equal distance and is hung with the help of a thread or thin wire from a nail in the wall. Another *Diyāli* in an inverted position is hung over the first one to serve the purpose of a lamp-shade. It is entirely wheel-made and occurs only in unslipped red ware.

The other vessel called *Ger* has a wide mouth and elongated convex profile with a pointed bottom and is used to form the chain of buckets in the *Persian* wheel. It is made only in unslipped red ware by a combination of wheel and hand. The decoration applied to it consists of incised slanting strokes all over the body.

Techniques of manufacture

(i) *Potting :* Clay for making pottery is obtained from the village pond because it is sticky due to being under water for greater part of the year. It is crushed to powder after drying it in the sun. Ash or, sometimes, donkey's dung are mixed in small quantities to temper it and prevent the pot from breaking up or developing cracks. The clay is then kneaded with feet to convert it into a thick paste.

Three methods are employed for manufacturing pots, namely (1) Hand method (2) Wheel method and (3) Combination of wheel and hand methods.

The hand method is used for making only very simple forms. Vessels made in this way do not attain perfect symmetry. In hand method a lump of clay is expanded into the required shape by putting it on an inverted pot and then beating and pressing it with hands. Then with the help of fingers the edge is smoothed. For obtaining a good edge, sometimes a thin flat iron piece is used to smoothen it. *Tawā* and sometimes *Kelrī* (with bevelled or flattish rim) are prepared in this manner.

In wheel method (Pl. X, 1) the entire pot is shaped on wheel, ***Chhoti-Kundī, Kulkī, Shakorā, Dhākni, Bujārā, Bujārī, Jawārio*** and ***Diyāli*** are prepared by this method. This method is employed for making small vessels.

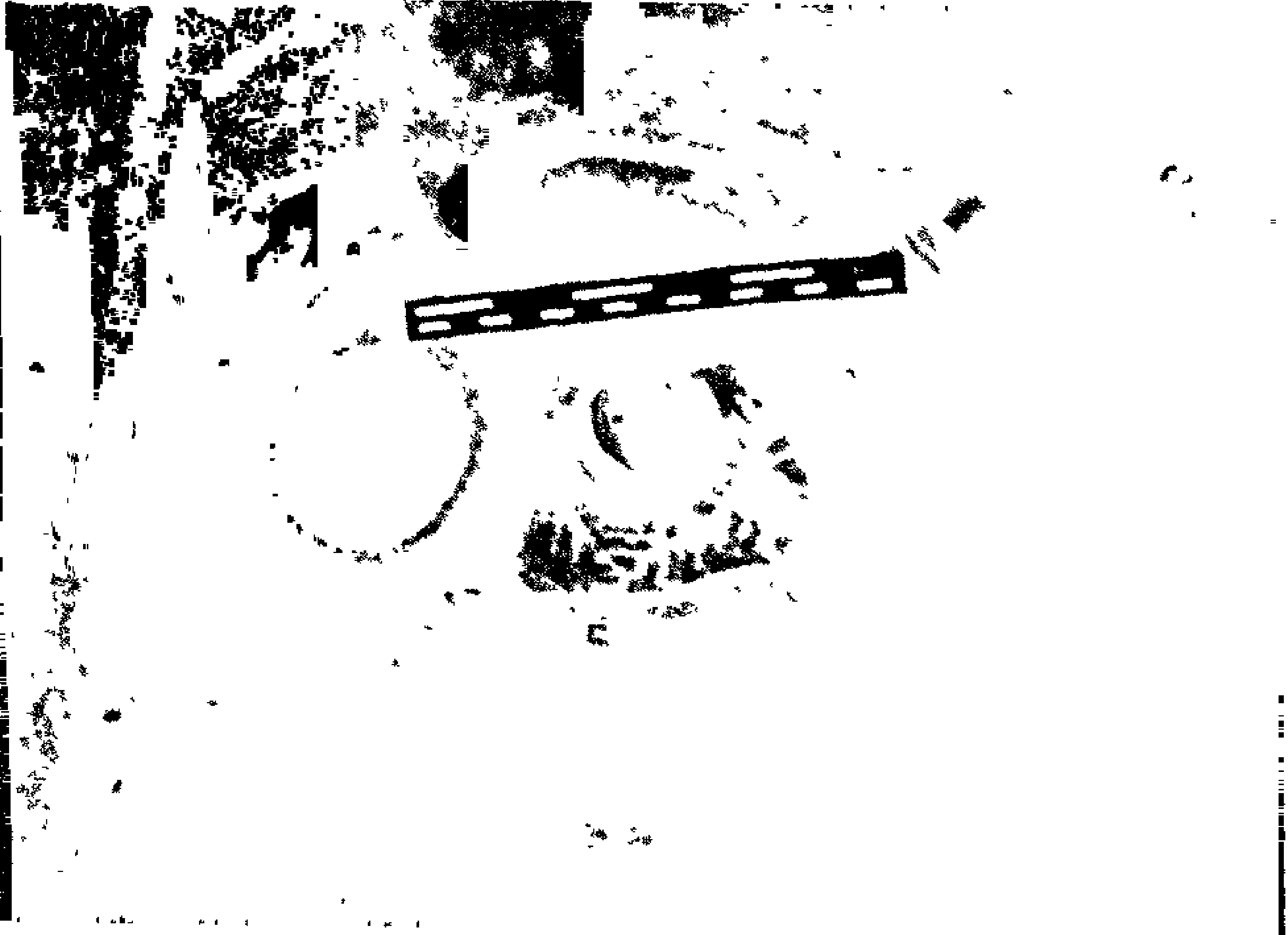
In the combination of wheel and hand methods (Pl. X, 1-2) a small pot with convex-sides and flat base (Pl. X, 1) is prepared on the wheel and allowed to dry. When it is in leather hard condition it is carefully beaten on the outer surface by a flat surfaced wooden mallet, while from the inside, support is given by a stone dabber (Pl. X, 2). In this manner the pot is slowly expanded and given a more globular shape. The final product is much larger



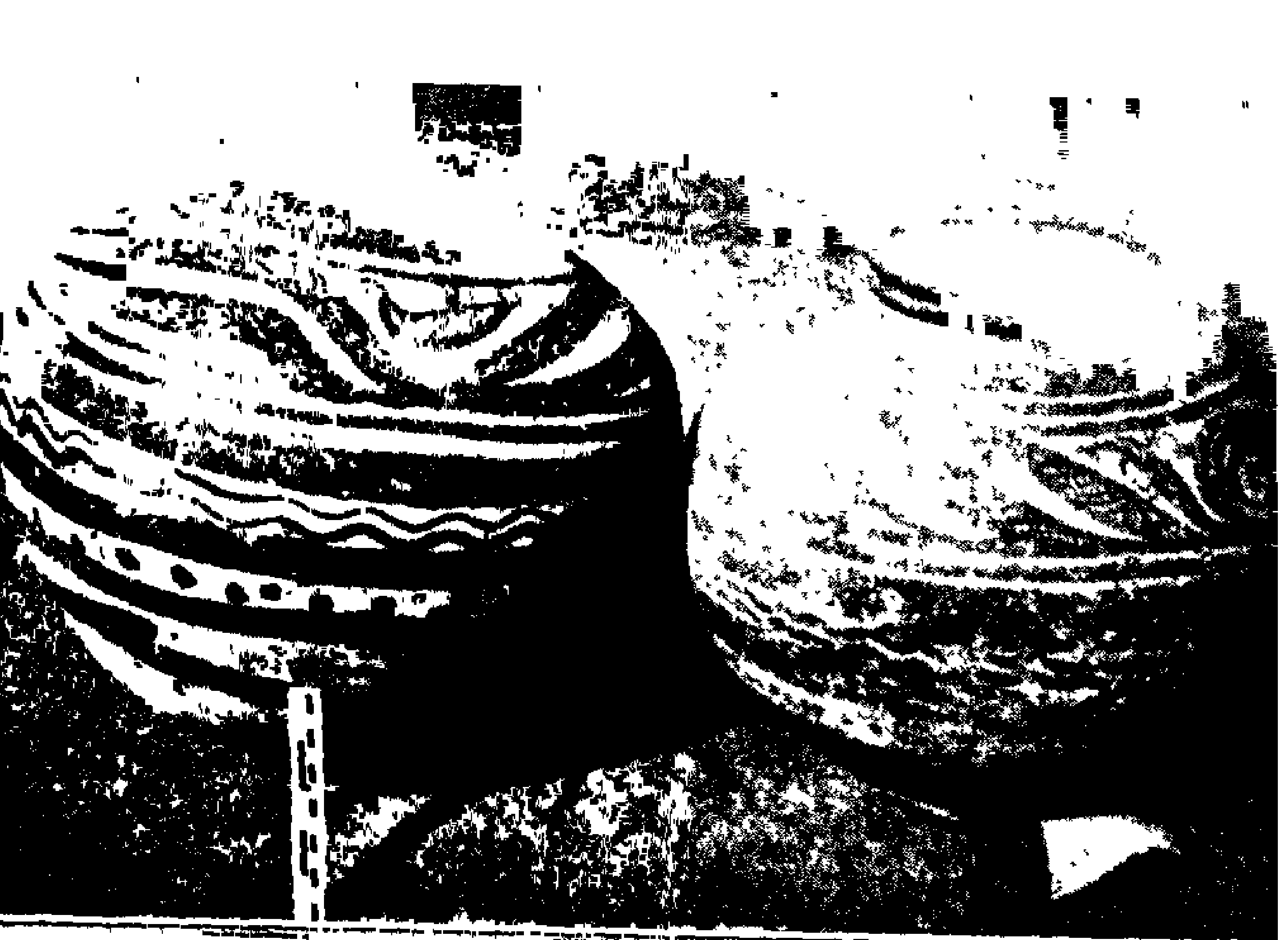
a



b

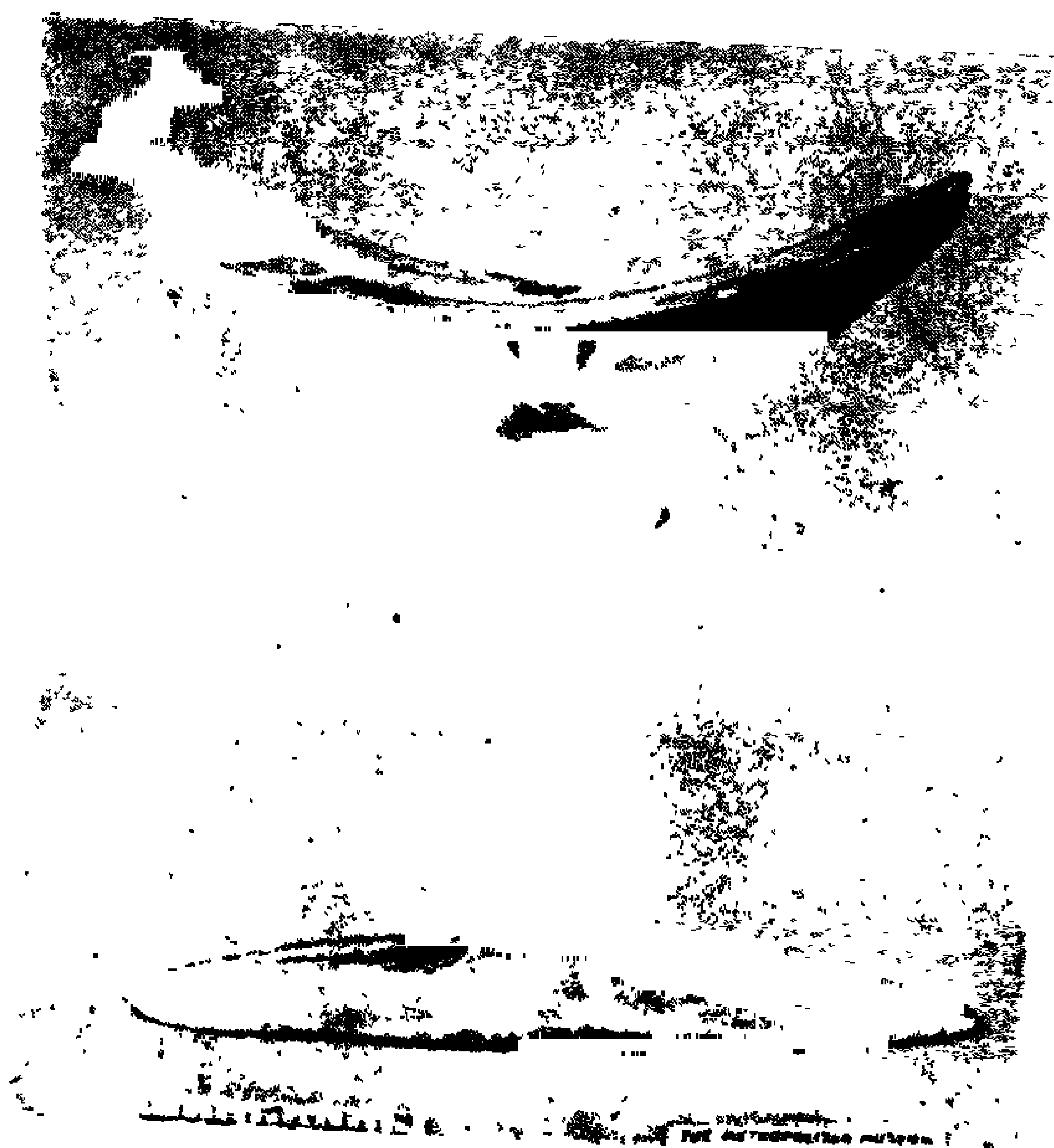


c





Pl. XIIa : Head-rests from T. Narsipur and Hallur



Pl. XIIb : Wooden headrest (Egyptian)
(*Courtesy* : Dr. Henry Fischer)

and thinned than the parental one. All bigger pots like *Matkā, Matkī, Handī, Kulkā* are made by this method as such pots cannot be made directly on wheel because of their large globular size. In such pots no striation marks can be seen except over the neck and rim.

Surface Treatment

Many vessels are given surface treatment to make them look more attractive. This treatment consists of one or more of the following: slip, wash, burnishing.

For producing a slip a thin coat of clay or hametite (*geru*), *lime* (*arash*), yellow mud (*pind*), or powder of white stone (*palevā*) is applied with a piece of cloth over the outer surface of the pot and over the rim on the interior. Sometimes a slip is produced by dipping the pot in the thick liquid of colour. The slip is generally applied on narrow-mouthed pots like *Matka, Matki, Handi, Kulkā* and *Chhotā-Kulka* on outer surface only, while on broad pots like *Chhotī-Kundī, Barī-Kundi, Kulkā* (*Tāvni*), and *Kulkī* it is given on both surfaces.

Burnishing is done only in Black ware over the slipped surface. Two methods are employed for burnishing. In the first, which is more common, burnishing effect is produced by rubbing a large garland made of *Kangas** beads to and fro over the outer surface of the pot (Pl. X, 3). The second method consists of rubbing the pot with small quartz pebbles held in the hand. During the process of burnishing a thin coat of clay is applied to produce a smooth effect. Sometimes oil is also applied to bring a shining effect.

Firing

The method of firing is of considerable significance in the study of pottery as it brings about changes in the surface and colour of pottery that produces very different looking ware. In Mewar firing is done in an open kiln and suitable modifications in this method are effected to produce the two kinds of ware. Separate kilns are required to produce Black and Red wares. The basic kiln is as follows:

The kiln is circular in shape and is set on flat, open ground. First a thin platform of ash or mud, about two inches high is prepared. Over this a layer of small pieces of wood or cow-dung fuel is arranged. Bigger pots are kept with their mouths facing upwards. Small vessels are arranged in several layers over these pots. Very small pots are placed inside the bigger ones. The final shape of the kiln is that of a dome (Pl. X, 4). In the empty places between pots, bits of fuel are inserted. On the top of the kiln a broken *Haṇḍi* is

* Kangas is local wild tree whose dry seeds, about a centimetre and a half in diameter, are strung together to form a garland.

placed in an inverted position to serve as a funnel for the release of smoke. The kiln is then fully covered with broken pots and sherds.

Fire is lighted in the kiln in the evening just after sunset and it burns for several hours in the night. Next day in the morning when the heat in the kiln has cooled down, vessels are taken out from it.

To produce Black ware the kiln is covered with dried leaves, grass, dust ash etc. to prevent the smoke from escaping from inside the kiln. In this manner all the smoke is retained inside the kiln and oxidization is prevented. The vessels turn black after firing.

In case of Red ware vessels the preparation of kiln differs in two respects. Firstly, vessels are placed in an inverted position, the mouth touching the layer

of ash or cow-dung cakes. Secondly the dry leaves, grass, and straw, etc. are not poured over the kiln, thus allowing the smoke to go out and the oxidization to take place. The pots, therefore, turn red after **firing.**

Decoration

The pottery for domestic use is utilitarian but it does not mean that the pots are devoid of any artistic decoration. On most of the vessels used in Mewar to-day, decoration of some type or the other is applied. It can be divided into three categories: (I) Painting, (II) Incision, and (III) Applique.

I. Painted decoration is applied to Red ware vesesls of both slipped and unslipped variety. It occurs only on the outer surface and is for the most part confined to the bigger vessels. It may be restricted only to the neck or might extend to shoulder and belly and sometimes even cover as much as three-fourth of the vessel surface (Pl. XI, 4).

Painting is executed either in red on a white background or in white over a red background. The motifs painted are mostly simple linear and geometric and rarely naturalistic. The following motifs occur either individually or in combination.

(1) Simple bands (Fig. 21, 11)
(2) Short strokes (Fig. 21, 8)
(3) Wavy lines (Fig. 21, 10)
(4) Loops (Fig. 22, 10)
(5) Hook (Fig. 21, 7)
(6) Leaf (Fig. 22, 11)
(9) Comb-pattern (Fig. 21, 13)
(9) Com-pattern (Fig. 21, 3)

(10) Butterfly Fig. 21, 9)
(11) Zig-zag (Fig. 21, 9)
(12) Lattice (Fig. 22, 2)
(13) Frond (Fig. 21, 8).

In most cases the painting is done before the pot is baked but in some vessels such as *Barā-Kalash* and its lid, *Bujārā,* it is done after firing. Designs are executed by a brush made of donkey's hair or by a thin stick with a piece of cloth tied at its end. White pigment is prepared from the powder of a locally available white stone (*palevā*), while the red colour is obtained from hametite (*geru*). Very rarely yellow colour made of turmeric powder is also used.

II. Incised decoration is primarily characteristic of Black ware though sometimes it is found on slipped red ware as well. This decoration is confined only to bigger vessels and is executed between neck and belly. The following designs occur in this.

(1) Wavy lines (Fig. 22, 12,; Pl. XI, 2)
(2) Check pattern (Fig. 22, 8)
(3) Simple bands (Fig. 22, 6; Pl. XI, 2)
(4) Joined diamonds (Fig. 22, 9)
(5) Ziz-Zag (Fig. 22, 6)
(6) Triangles (Fig. 22, 7)
(7) U shaped (Fig. 22, 5) and
(8) Strokes (in groups) (Fig. 22, 4; Pl. XI, 2)

This decoration is done after the vessel has acquired leather-hard condition. It is produced by a sharp-edged thin pot-sherd. While executing simple horizontal bands the vessel iskept rotating with the left hand at a slow speed. For executing other motifs he vessel is kept stationary.

III. Appliqué decoration is applied only as a horizontal band on the shoulder. It is executed while the pot is on the wheel. The potter manipulates a small lump of clay and produces a thin band on the surface, generally over the shoulder of the pot. He joins the ends together by pressing them with his thumbs. The applique band is then decorated with incised marks.

Social Aspects of pottery making

Pottery making in Mefwar is practiced by the ***Kumbhars,*** as elsewhere in India. Though as in other castes there are many *gotras* and *Kumhars* as well, for our purposes only one social distinction is significant. There are two types of *Kumhars* namely (1) those who mix donkey's dung in the clay for pot making, and (2) are those who do not. The former are known as *gadhelia Kumhars*

and are considered inferior by the other *kumhars*. There is no inter-marriage between the two groups.

Division of Labour

Although pottery making is largely man's work, all members of the family share the work involved. However, there is a strict division of labour on the basis of sex. All work on the potter's wheel is done by men only; women are not allowed to touch it. Similarly all decoration work including application of slip and burnishing are done by women. In other specialized tasks, like the preparation of clay, arrangement of pots in a kiln etc. both men and women can take part.

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SIGNIFICANCE OF POTTERY HEAD-RESTS FROM NEOLITHIC SITES OF KARNATAKA

By

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IT WAS Robert Bruce FOOTE who discovered the site of T. Narsipur and published among other things, a 'most interesting' pottery object which he designated 'neck rest'.[1] However, for more than 50 years after Foote's publication, no single instance of this form of objects was reported in any part of the peninsular India. In the past decade and a half, SESHADRI of the Mysore Archaeological Department, F. R. ALLCHIN[2] and the author independently collected six more specimens from the surface of the site. The other form of possible evidence of these objects has been reported by ALLCHIN from Piklihal.[3] Here six pairs of objects were bruised on the rock face above site VIII,[4] which ALLCHIN assigned on general grounds of style and patination to a group dating from the neolithic period. He identified them as either offering stands or head-rests, the latter being distinctly more probable, on the basis of comparison of form with T. Narsipur specimens. (Pl. XIIa, 1-2; Fig. 23a, 2-3).

Almost all the pottery specimens are made of burnished grey ware, typical of the Karnatak neolithic. They are sometimes painted with red ochre, after they were fired. They have a carefully burnished concave top, and a hollow stand, recalling the foot of a footed-bowl. However, all the known pieces were surface finds. The exact utility or purpose of these objects were also unknown until recently.

In the recent excavations at T. Narsipur, SESHADRI found a complete specimen associated with a neolithic burial.[5] The head rest was placed near the right side of the skull, in the burial pit. This find at once established the sepulchral use of these objects which had long remained conjectural. Another fragment turned up from the floor of a circular house at Hallur.[6] (Pl. XIIa, 3; Fig. 23b, 1). A few specimens were also found in the habitational levels at the site of Hemmige, not far from the site of T. Narsipur.[7] Since radio-carbon dates are now available for the neolithic levels of both T. Narsipur and Hallur, these objects can safely be assigned to a period beginning from C. 1800 B.C.[8]

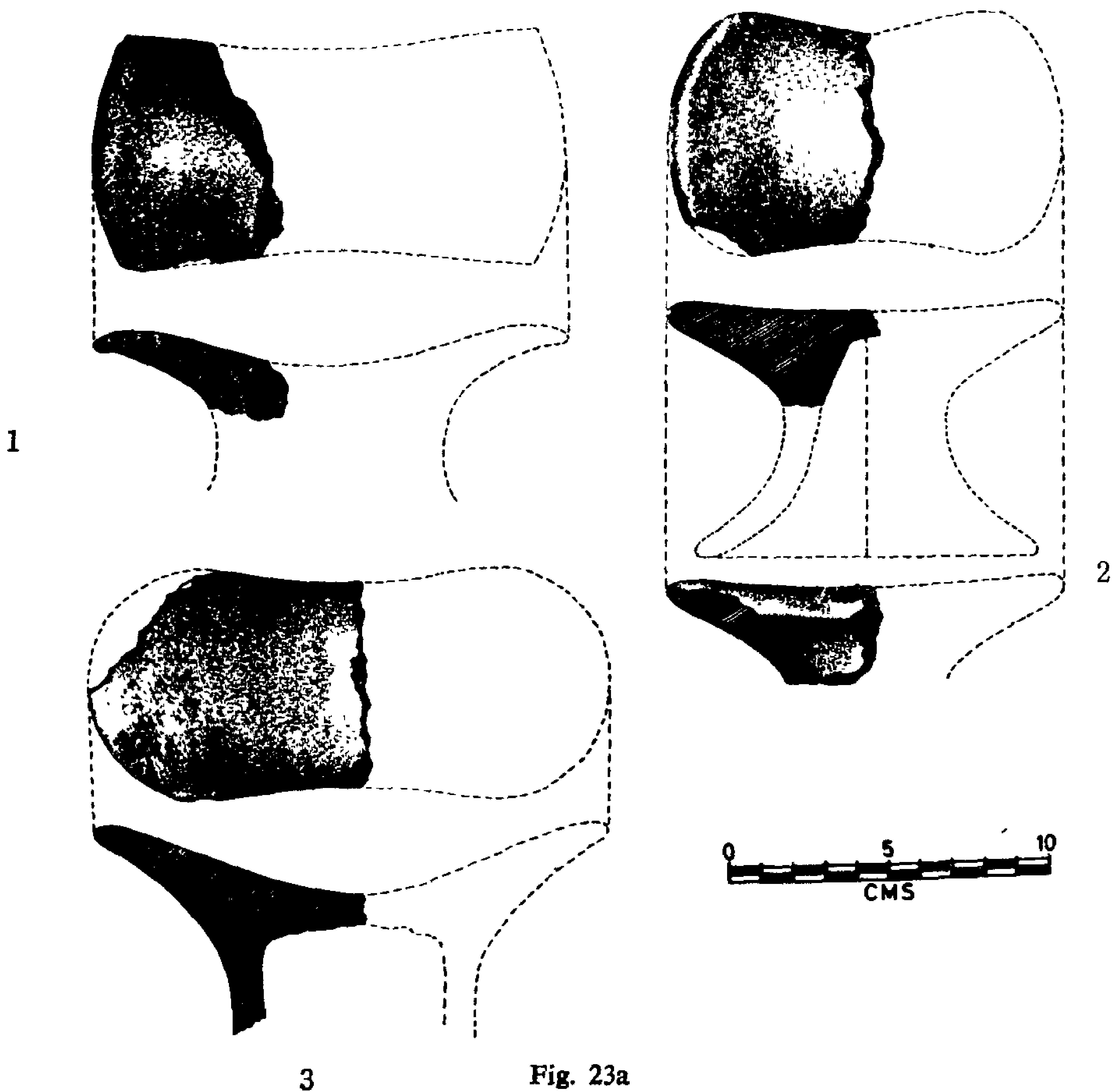


Fig. 23a

Once their utility and chronological position in the Indian archaeological context are established, we can examine their significance. Their specialised use in burials show that they form a highly distinctive cultural trait. Their geographical distribution, on the present showing, is confined only to the neolithic Karnataka region of south India (Fig. 23a). Their presence in this limited region and period is all the more surprising, because they do not appear to have become popular in a wider sphere in India. Nor do we find any modern ethnographic references to them.[9] The only other find of a head-rest is the specimen from Chanhu-daro assigned to Jhukar levels.[10] This is a painted rest, with a broad, oblong base and having triangular slits on the sides. It is quite unlike the examples we are considering here, and therefore, is not strictly comparable, although possibly sharing common function and of similar age.

This leads us to speculate whether this object and the cultural trait of using it in a burial, are foreign in origin, and indicate possible external contacts.

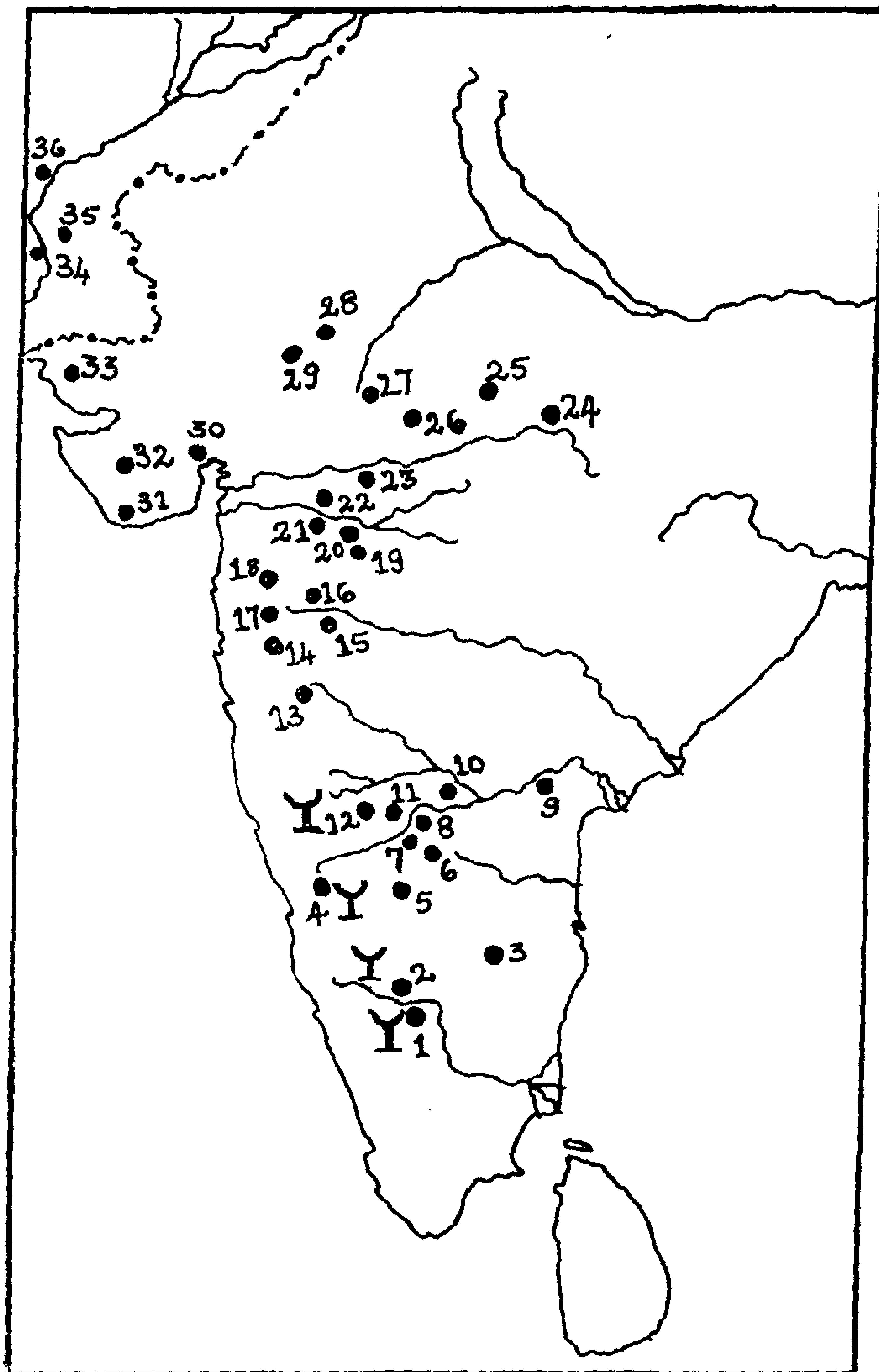


Fig. 23b

When we look for similar examples from Iran or Mesopotamia, the result is a blank. Comparable evidence comes from a different region. Head-rests, made of various materials such as ivory, lapis lazuli, wood and occasionally pottery have been found in Egypt from pre-Dynastic times down to the Roman period.[11] They are also found in a variety of forms, but one of the most common types is almost similar to the examples from the neolithic sites of Karnataka. Of the Egyptian examples, those found in a table-shaped cabinet in the tomb

of Tut-Ankh-Amen are worthy of mention as they clearly demonstrate their purpose and use.[12] The finest of these is of ivory, now in the Metropolitan Museum of Art, New York. (Pl. XIIb) The myth it represents conceives Geb and Nut — the earth god and the sky goddess — as husband and wife, separated by their father, Shu, god of atmosphere. The caryatidal figure, Shu, thrusts himself between earth and sky, and holds high the head of the pharoh resting on the concave top, so that the king might rest in heaven for ever. This clearly indicates that these head rests were meant for sepulchral use.[14] That such a use was common is indicated by the fact that head rests invariably formed part of the burial appendage. While the tombs of the Pharaohs contained head rests of precious materials, the tombs of the members of the lower strata of society were provided with wooden or pottery rests.[15]

In Africa, there is ample modern ethnographic evidence for the use of head rests. The tribes of Maszana and Makabanga of southern Rhodesia, and the Balubas of Congo use wooden head rests.[16] There is also a wider variety of forms. As suggested by ALLCHIN, their use to the present day probably indicates the diffusion of this cultural trait from ancient Egypt over a period of many centuries.[17] Was the neolithic trait noticed in India also the result of such a diffusion from ancient Egypt ? Or does it indicate any contacts between the two regions ? If such contacts exised, what were the routes by which such contacts traversed ? Natural questions, but very difficult to answer.

Remarkable similarity in form and identical function no doubt tempts one to think of possible contacts between the two regions. So far there is no evidence to show that any conacts existed between the Indus Valley and Egypt. Even if any, they would only be indirect ones.[18] Therefore a land route via the Indus Valley does not appear to be plausible. We have therefore to explore the possibility of sea routes. But the vast expanse of the Arabian sea and the absence of evidence of any maritime activity in the peninsular region at such an early phase of history make it difficult to explain cultural contacts. There is, no doubt, that Egyptians navigaed the sea. There are various references to several naval expeditions sent by the rulers of Egypt from the V and VI dynasties, to the distant and mysterious land of Punt.[19] One such expedition has been illustrated in relief sculptures, on the walls of the funerary temple of queen Hatshepsut, at Deir El-Bahri.[20] Here the flotilla of five large ships sailing from their Red sea ports, their arrival in Punt where the inhabitants lived in grass huts built on platforms and reached by a staircase, the Egyptians offering them the trade goods brought from Egypt, strings of beads, axes, weapons and the triumphant return with a large number of presents from the chief of Punt to the Pharaoh, are graphically depicted. All the objects received and brought back from Punt have been listed, and are worth mentioning: myrrh trees with their bulb-balls carefully protected in baskets in order to transplant in the Thebes; precious gum, ivory, ebony, apes, fragrant wood, *khesyt* wood, cinnamon,

inmut incense, *sonter* incense, eye-paint, green gold, throw sticks, shells, and 3300 small cattle besides other materials.[21] Punt has been variously located in south Arabia, Ethiopia etc.[22] But on the basis of the animals present, particularly the dog-faced monkey and head of an animal taken to represent that of a giraffe, Hilzheimer locates Punt in the coastal region of Somalia.[23] He further states that study of other objects, especially of he accompanying plants by a botanist would provide the most important clue in the exact location of Punt.[24]

In this context we may draw attention to the fact that surprisingly the neolithic Karnatak region is also known for some of the articles mentioned in the above list. For example, many of the neolithic settlements are located near famous gold mines, and there is evidence to show that gold mining has gone on since the neolithic times;[25] western forests of Mysore region is known for elephants thus ensuring a good supply of ivory; and sandal, the fragrant wood, has been grown for ages in the forests of western ghats of Mysore. According to the *Rāmāyaṇa*, the heart of Karnataka region is known as Kishkiṅdhā, the kingdom of the monkeys. Punnata — Pounnata of Ptolemy — was also the name of a local kingdom, 'adorned by the rivers Kaveri and Kapini', in the southern Mysore and mentioned in an inscription of Ca. A.D. 300.[26] Further, writing on *Pali* or *Vanniyar* caste, Thurston records a tradition according to which 'a book has been written by a native to show that the ***pallis*** (Pullies or Vanniyar) of the south are descendants of the fire races (Agnikulas) of the Kshatriyas and that the Tamil Pullies were at one time shepherd kings of Egypt'.[27] Whatever these evidences and traditions may echo, it is not intended here to suggest any identification of Punt with Karnataka region. The aim is simply to draw attention to various evidences which, though distantly, indicate possible connections with Egypt.

Before we proceed further, there is one more piece of archaeological evidence to which we have to refer. From the floor of the house at Hallur where a fragment of a head rest was found, some charred grains were also recovered. These grains have been identified as *Rāgī* (local Kannada name), ***Eleusine coracana***.[28] The same material has also been reported from another neolithic site, Paiyampalli in Madras State.[29] This millet is said to be of African origin and was first domesticated there.[30] Again, the geographical distribution of this millet is confined only to the south, and even to-day it forms main diet of the south Indian peasant. It will be of great interest, in the context of examining contacts with Africa to find out how and when this millet reached peninsular India.

To the above may be added, the following. LAL's excavations at the Nubian site of Afyeh have exposed the 'A group culture' characterised by the occurrence of saw blades, polished stone axes of basalt, painted pottery and incised wares.[31] This culture, usually dated to Ca. 3000 B.C., is now dated by radiocarbon method

to the 2nd quarter of the 3rd millennium B.C. These cultural elements are remarkably similar to those of the neolithic-chalcolithic cultures of the Deccan.

Secondly, the graves of the 'C group culture' at Tumas broadly dated to the first half of the 2nd millennium B.C. yielded, among other objects, black-and-red ware bowls and red ware stands, which are remarkably similar to those found at Maski (Fig. 23b, 11), in the iron age graves. " In fact, the resemblance is so very striking that on a recent occasion, an expert actually mistook the Nubian material for the south Indian one".[32] The use of circumscribing stone-circle in the Nubian and south Indian graves is also another common feature. The south Indian Iron Age graves were first stratigraphically dated by Sir Mortimer Wheeler to Ca. 300 B.C.[33] Recently this date was pushed back to Ca. 700 B.C.[34] However, radiocarbon dates for the overlap phase of neolithic- iron age levels, with typical black-and-red wares and iron tools, indicate a date as early as the beginning of the first millennium B.C.[35]

All these evidences no doubt point towards possible contacts between Egypt and south India. But the vast stretch of the Arabian sea startles us in substantiating such connections. From the Egyptian side, no doubt, evidences indicate that they were capable of undertaking distant voyages in ships. But the evidence from the Indian end, is very slender indeed. To establish firmly any such contacts, more tangible archaeological evidence should be forthcoming. The use of head rest in a burial appear only to be a pointer in this regard. It should be pointed here that thorough explorations of the western coast of the peninsular region are still wanting. We now know that trade contacts between Indus Valley and Mesopotamia did exist via the Persian Gulf, and trading ships came to Indus ports of Saurashtra, where the remains of a dockyard have been unearthed.[36] Indus sites have been located as far south as the Kim estuary, 23 miles south-west of Broach. There are many natural harbours, such as Bhatkal and Karwar on the west coast of Karnataka region. What is now required is a detailed and thorough exploration of this area. Therefore, "before attempting a detailed correlation between these two 4000-kilometre-apart cultures, would it not be worthwhile to explore the coastal regions of south Arabia and south-eastern Iran"[37] and, we may add, the west coast of the Indian peninsula ?

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4. Allchin, F. R. 1966 : *Op. cit.*, fig. 2.
5. Unfortunately this specimen is still unpublished. Permission to illustrate it is not available, until the report of excavation is published.

6. Now in the Museum of Art and Archaeology, Karnatak University, Dharwar.
7. *Indian Archaeology — A Review*, 1964-65.
8. The following are the radio-carbon dates for neolithic levels:
   T. Narsipur 3755 ± 100, i.e., B.C. 1805.
   Hallur 3660 ± 105, i.e., B.C. 1710 (Early levels)
   3055 ± 108, i.e., B.C. 1105 (Uppermost neolithic levels)
9. The only ethnographic evidence for the use of head rests is that referred by Elwin, among the Murias. Here the head-rests are long, narrow wooden pieces raised some 2" from the ground, and are known as *kutul*, used either as seats or pillows. See Elwin, V., *The Murias and their Ghotul*, p. 331, fig. 54, and p. 332, figs. 55, 56.
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13. *Ibid.*, Pl. XXXVI B; see also Chenry, J., *Lost Worlds*, figure on p. 47.
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15. One such workman's tomb with a wooden head rest is reconstructed and exhibited in the National Museum, Warsaw.
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    Further, because frankincence and myrrh are natives of only two parts of the world, south Arabia and north Somalia; see Gus. W. van Beek, "Frankincense and Myrrh", *The Biblical Archaeologist*, Vol. XXIII, No. 3, p. 72. These two were among the objects brought from Punt.
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24. *Ibid.*, p. 114.
25. Allchin, F. R. : "Upon the antiquity methods of Gold mining in Ancient India". *Journal of the Economic and Social History of the Orient*, Vol. V, part II, pp. 195-211.
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33. Wheeler, R. E. M. 1959 : *Early India and Pakistan*, p. 63.
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37. Lal, B. B. : *Indian Archaeology Since Independence*, p. 63.

Appendix

Sites mentioned in Fig. 23b.

1. Hemmige
2. T. Narsipur
3. Paiyampalli
4. Hallur
5. Brahmagiri
6. Sanganakallu
7. Kupgal
8. Tekkalakota
9. Nagarjunakonda
10. Utnur
11. Maski
12. Piklihal
13. Sonegaon
14. Chandoli
15. Nevasa
16. Daimabad
17. Jorwe
18. Nasik
19. Tekwada
20. Bahal
21. Savalda
22. Prakash
23. Navdatoli
24. Tripuri
25. Eran
26. Kaytha
27. Nagda
28. Gilund
29. Ahar
30. Rangpur
31. Somnath
32. Rojdi
33. Desalpur
34. Amri
35. Chanhudaro
36. Mohenjodaro

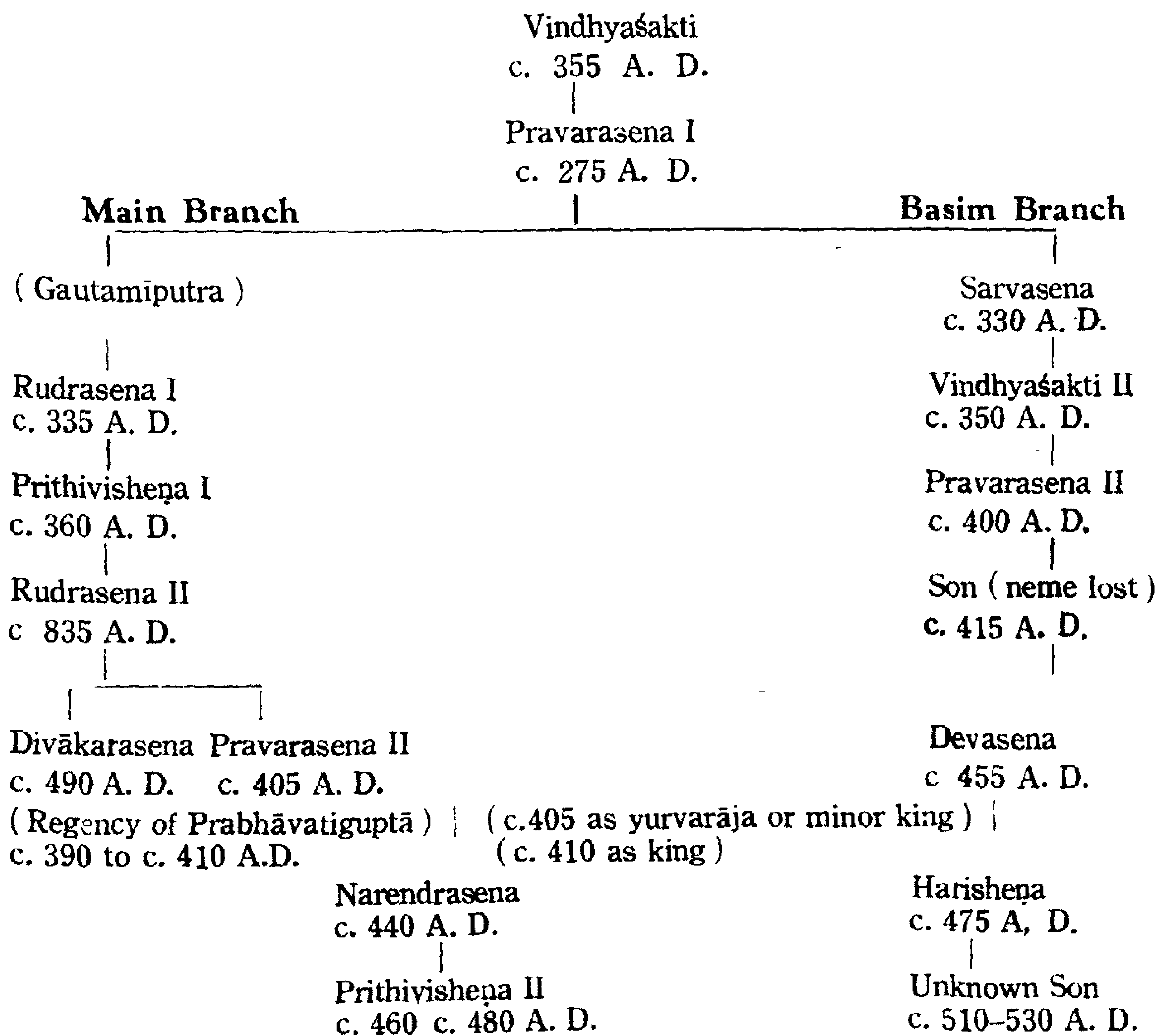
Sites with evidence of Head-rests

A RE-EXAMINATION OF THE GENEALOGY AND CHRONOLOGY OF THE VAKATAKAS

By

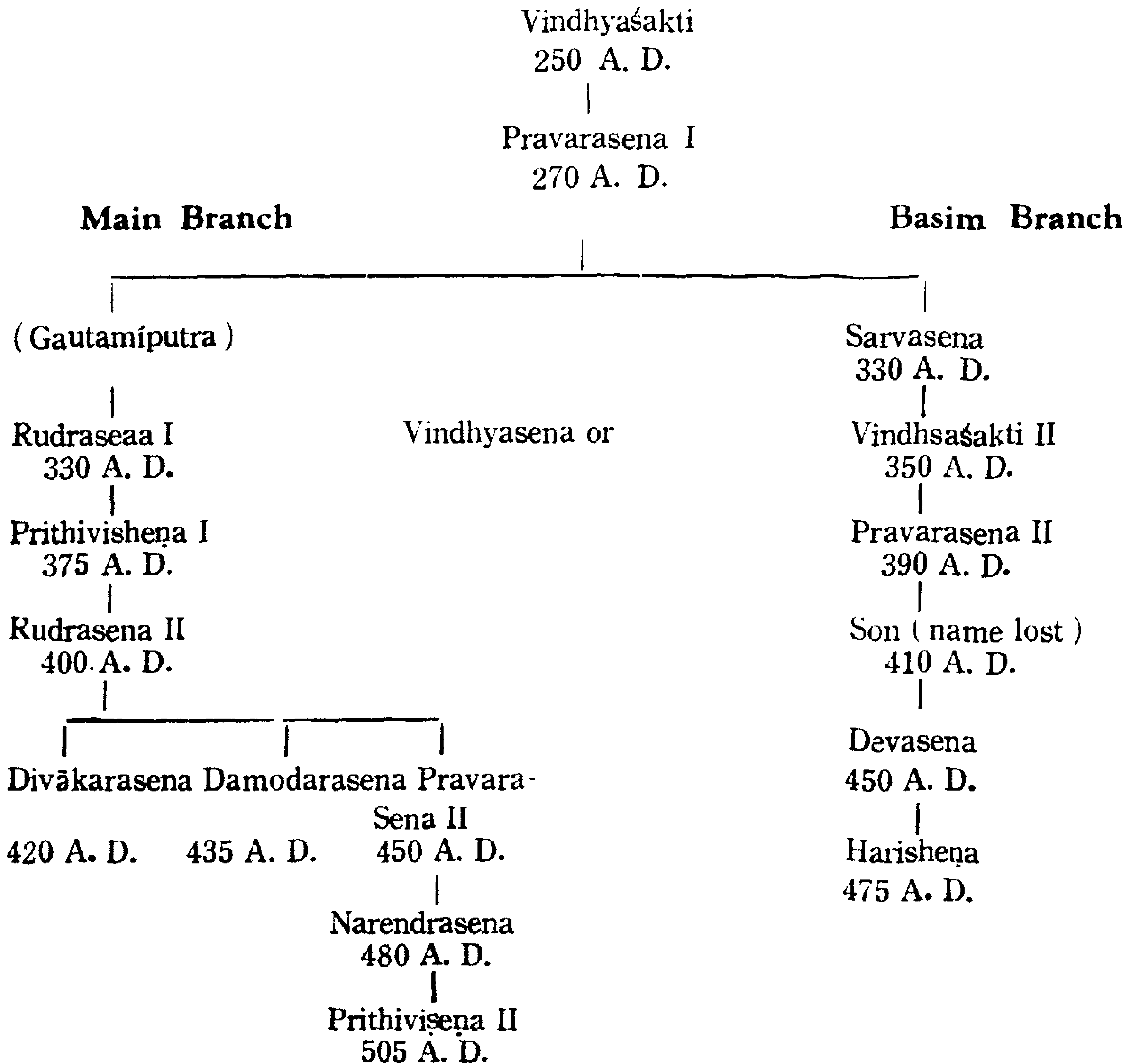
NISAR AHMED

A. S. ALTEKAR, who for the first time lucidly reconstructed the history of the Vākāṭaka dynasty, proposed the following chronology :[1]



The above chronology is based on the fact that Prabhāvatīguptā, the wife Rudrasena II, was the daughter of Chandragupta II.[3] He presumes that their marriage was celebrated in 380 A.D.[4] as their youngest son Pravarasena "was spending his early youth in the pursuits of pleasure in c.410 A.D."[4] and when his maternal grandfather died in 414 A.D. he was about 25 years[5] old because he 'assumed the full control of the administration'.[6] As Pravarasena II was born in 390 A.D. and "he was at least the second if not the third or fourth child of his parents", their marriage may be placed in 380 A.D.[7] But Sircar rightly holds that Pravarasena II called "himself Śaṃbhoḥ prasādadhṛita kārtayuga and Paramamāheśvara and was a devout Śaiva throughout his long reign."[8] This goes against the theory of his 'sub servience to Chandragupta II'[9] who was a Vaishṇava.

After sometime R. C. Majumdar, realising that Altekar's 'scheme of chronology rests upon very weak foundations',[10] gave a different genealogy and chronology[11] which is given below :



The foundation stone on which this chronological building has been constructed is the Rithapur plates,[14] which give the expression — *sāgra-varsha-śata-diva putra pautrā* for Mahādevī Prabhāvatīguptā.[15] The editor of the plates puts two explanations — (i) 'who has sons and grandsons, a life of full hundred years and will (in the end) live in heaven' and (ii) 'who has renowned sons and grandsons and who has lived a life of full hundred years'. The first explanation has been rejected as being meaningless and the second modified. Majumdar thinks that '*diva* is really *dīva*[16] and following Jagannath Agrawala[17] takes *jī* in place of *dī* to mean that 'Prabhāvatīguptā lived for more than hundred years and had her sons and grandsons living at the time'. This is also accepted by Sircar.[16] But against this interpretation Mirashi rightly questions the way in which Majumdar "dissolves the compound *sāgra-varṣa-śata-jīva-putra-pautrā.* He probably takes the first member as *sāgra-varṣa-śata-jīva* meaning 'living for a full hundred years. In that case the second member of the compound would be *putra-pautrā* which cannot be taken as a *Bahuvrihi* compound, meaning who has sons and grandsons (living at the time)." For the above meaning a *taddhita* affix is needed at the end.[17] Therefore, Mirashi feels that the word *jīva* goes with *putra* and *pautra, meaning* 'who has living sons and grandsons, and the phrase *sāgra varṣa śata* qualifies her sons and grandsons and not Prabhāvatīguptā hereslf.[18] Therefore the expression should not be taken too literally. It must have been used "like the epithets *dīrghāyuḥ* or *āyushmat* applied to small children".[19] Mirashi also points out that "similar expressions *jīva-sutā* or *jīva-putrā* occur in the Rigveda, the Mahābhārata and the Rāmāyaṇa as well as in some old inscriptions.[20] He further writes: "To have living sons and grandsons is regarded as a sign of good fortune and is therefore often mentioned in the description of a woman" and "to a widow like Prabhāvatīguptā a long life of a hundred years is most distasteful."[21] It may also be recalled that the word *śata* must not always be taken for 'hundred'. Sometimes its usage appeared for 'more'. Samudragupta on his standard type coins inscribed the legend, *samara-śata-vitata-vijayo-jita-ripurajito-divaṁ-jayati.*"[22] Altekar translates it, "The invincible (king) who had won victories on a hundred battlefields. And conquered the enemies, wins the heaven."[23] But the exploits of Samudragupta recorded in the Prayāga Praśasti[24] do not figure in a hundred unless we imagine that he fought each of his rivals over and over again. Thus this expression must be interpreted to mean "who has sons and grandsons who will live for hundred years."[25]

The theory of Majumdar's chronology is based on the contention that the hundredth year of Prabhāvatīgupta passed "after and not before 455 A.D.,[26] when her brother Kumāragupta died."[27] He says that "if Prabhāvatīgupta lived to an old age of more than hundred years it is only reasonable to assume that she survived her brother Kumāragupta I, who was probably the eldest son of his father. It is, of course, not impossible that Kumāragupta also lived for more than hundred years and was considerably younger than his sister."[28]

But he does not hold the second possibility because "when nothing definite is known, we should proceed on the basis of a reasonable and probable state of things, rather than unusual and unlikely possibility."[29] He further suggests that most probably Chandragupta II "ascended the throne in 375 A.D. at about 30 and his daughter Prabhāvatīguptā was born about 365 A.D."[30] This shows that Chandragupta II was 20 years old at the time of his daughter's birth and her mother Kuberanāgā would have been married to him at the latest when he was 18 or 19 even if we accept that Prabhāvatīguptā was born nine of ten months after the marriage otherwise her marriage would have taken place before the 18th year of his age. Kumāragupta I was born from another queen Dhruvadevī.[31] For scholars who have faith in the Ramagupta's episode this Dhruvadevī was originally the wife of Rāmagupta the elder brother of Chandragupta II.[32] She is styled Mahādevī.[33] Generally the term mahādevī is taken for 'queen-mother'[34] or 'chief-queen'.[35] But Sircar feels that mahādevī simply means a 'queen'.[36] Undoubtedly its use in the official records of this family "had almost a constitutional significance".[37] However, it may be argued that Kubernāgā is also called Mahādevī in a Vākātaka charter.[38] But this was certainly "partial to her" and only "the legitimate Mahādevī's are as constitutional convention or practice always mentioned in the official Gupta records."[39] Therefore it is not unlikely that Dhruvadevī was married to him before his marriage with Kubernāgā. Between both marriages there would have been a gap of some years. Therefore his first marriage would have been performed at the latest when he was about 14 or 15 years old. It is very difficult to explain the reasons why both the marriages of Chandragupta were organised by his father Samudragupta, as this period falls in his reign, within a very short times, viz. 359 or 60 to 363 or 64 A.D., before Chandragupta II attained 21 years age proposed for majority by Majumdar[40] and moreover when he had other sons, as is known from the Eran epigraph.[41] Elsewhere Majumdar himself writes : "Chandragupta II is known to have formed marriage alliances with some powerful ruling families. He married Kuveranāgā of the Naga family and had a daughter by her named Prabhāvatīgupta."[42] Chandragupta II ascended the throne in 376 A.D.[43] Even if we accept that Kuberanāgā was married within two or three years after the coronation and her daughter was born about 380 A.D., Prabhāvatīguptā's marriage, supposing 16 as a suitable age, would have been performed about 396 A.D. Therefore, in 450 A.D., when Pravarasena II came on the throne she was not more than 70. To suit his contention that Prabhāvatīguptā was 'more than eighty years about this time'.[44] he has to push forward the dates of Pravarasena II and his successors by 15 years. In his view Prithivīsheṇa's reign ended in 540 A.D.,[45] but according to this scheme, it must have been in 555 A.D. But the coins of the Kalachuri king Krishṇarāja 'who flourished from *circa* 550 to 575 A.D.,[46] circulated over a very wide territory from Rajputana in the north to Maharashtra in the south and from Konkon in the west to Vidarbha in the east'[47] and Mirashi accepts that undoubtedly Gujarat, Konkan and Maharashtra including Vidarbha'

formed the parts of the Kalachuri empire at this time.[45] Again the region around Chanda which was a part of the kingdom of Prithivīshena II[18a] passed in the hands of the Śarabhapuriya king[18b] Prasannamātra and the commencement of whose reign cannot be placed after 550 A.D.[48] Evidently the Vākāṭaka territories were embraced by the Kalachuris and the Śarabhapurians with the beginning of the second half of the sixth century A.D. or a little earlier and therefore the last limit of the Vākāṭaka rule has to be fixed somewhere in the first half of the sixth century A.D.

According to Majumdar Prabhāvatīguptā had three sons, Divākarasena, Dāmodarasena and Pravarasena II and they were born before 420 A.D. as in that year she became a widow.[49] He also supposes that she was born about 365 A.D.[50] This means that she was about 55 at the time of her husband's death and her eldest son Divākarasena then was in no case more than 7 years as he did not reach the age of 21 until his 13th regnal year.[51] Supposing that she was married at the age of 16 shall we accept that for more than thirty years of her marital life she could not have any male issue and within the last 7 years she had three sons in succession? Therefore Mirashi observes: "This appears very unlikely. As he has himself said, in all cases where nothing definite is known, we shall proceed on the basis of a reasonable and probable state of things."[52]

Further the contention of Majumdar, that a person attaiied his majority in ancient times at the age about 21,[53] is a highly disputed issue. On this, Sircar rightly objected: "The suggestion, however, goes against the view of old writers on Indian law that 'one who has not reached his sixteenth year is called a minor."[54] In support of this he refers to principles laid down by Kauṭilya, Medhāthithi, Daksha and Nārada.[55] Majumdar, in reply, writes: The Hathigumpha Iscription of Khāravela seems to indicate that this prince became a *Yuvarāja* at the age of 16 and held this office for nine years till he obtained coronation as Mahārāja in the state of manhood in his twenty fifth year."[56] Sircar further strengthens his suggestion by saying "that there is absolute unanimity amongst writers on Indian law — ancient, mediaeval and modern — that boys attained to majority at the age of sixteen, while there is not a single evidence in support of the conjecture about the age of majority at twenty one."[57] He also quotes the Indian Majority Act of 1875 A.D. where 'year eighteen (twenty-one only in certain cases) was accepted as the age for major except in matters of marriage, dower, divorce and adoption.'[58] For the case of Khāravela he says that the king "received installation as Mahārāja after completing his twenty fourth year only shows that his predecessor (probably his father) died about this time."[59] Kane also writes that a person attained majority at the 16th year.[60]

Majumdar feels that Prabhāvatīguptā did not become a widow after 420 A.D.[61] Hence her last son must have been born at least about that time. According

to him, Pravarasena II ascended the throne in 450 A.D.[62] Thus at the time of the Rithapur charter, i.e. the 19th regnal year Pravarasena II, the ruling monarch was about 50 years. In this case Prabhāvatīguptā must have claimed to have *prapautra* and not only *pautra*.[63] Therefore, it is highly unwarranted to hold that Prabhāvatīguptā was more than a hundred years old when the Rithapur charter was drafted and that Pravarasena II ascended the throne at an advanced age.

Majumdar thinks that the expression in the Rithapur plates — Maharaja Sri-Damodarasena-Pravarasena-jananī refers to two different persons. He puts forward one objection against the prevalent belief. "Prabhāvatīguptā was more than 100 years old in the 19th regnal year of Pravarasent II. If the king had ascended the throne immediately after he had became major, as his identification with Dāmodarasena would imply, then he would have been of about 40 years of age at the time of Rithapur grant. As his mother was more than 100 years old, she must have been more than sixty when Dāmodarasena *alias* Pravarasena was born. This must be regarded as very unusual."[64] Therefore he pushes back the commencement of the period of her regency by 30 years and postulates that Pravarasena came to the throne at a comparatively advanced age. As she does not appear to have survived after the issue of the Poona plates he propounds that Dāmodarasena was another son of Prabhāvatīguptā and the elder brother of Pravarasena and ruled before the latter.[65] Sircar also feels that Dāmodarasena and Pravarasena were not the names of one individual. His contention is based on the above interpretation and presumption that Pravarasena ascended the throne 'at an advanced age' because Prabhāvatīguptā was 'more than eighty about this time'.[66] It is very strange that a charter issued by the mother of the ruling monarch as *Śrī Pravarasenasya rājyapraśāsata-saṁvatsare* is mentioned there,[67] does not contain any title for that sovereign, whereas he refers to his predecessor by the phrase *Vākāṭakanām Mahārāja*, in the above expression recorded in the genealogical part of the charter. "When we remember how particular the drafters of Vākāṭaka gants were about the use of this title in connection with the name of every Vākāṭaka king who actually reigned."[68] Surprisingly enough when, at a different place, this charter is said to be issued in the reign of Pravarasena. Here this ruler is styled *Vākāṭakanām Mahārāja*.[69] It may be recalled that the same expression with the change of the name of reigning prince and title — *Yuvarāja-Śrī-Divākarasena-jananī* — is mentioned in the geneaalogical portion of the Poona plates of Prabhāvatīguptā.[70] Even the word *jananī* is thought to be used in the Rithapur plates for the two persons, we have to explain, why she called herself the mother of only two sons if she had three sons. It may be argued that Divākarasena had died and therefore his name was omitted from the Rithapur plates. The same was the case with Dāmodarasena, as this charter was drafted in the time of Pravarasena. Further, Pravarasena II seems to have occupied the throne at a young age.[71] This goes against the

creation of the third son which is aleo based on the assumption that Pravarasena II ascended the throne 'at the comparative advanced age'.

Even keeping aside the above discussions, the theory of two independent ruling sons of Prabhāvatīguptā does not appear convincing. Majumdar writes that Divākarasena ruled for fifteen years from 420 to 435 A.D. under the regency of Pravh5vatīguptā,[72] and after that his younger brother Dāmodarasena ruled from 435 to 450 A.D.[73] before Pravarasena ascended the throne. In this case Dāmodarasena would have been born in 417 A.D. and Pravarasena in 420 A.D. because the elder brother Divākarasena could not reach his majority, that is to say the age of 21 until 435 A.D., and therefore he seems to have been born not before (435-21) 414 A.D. As Dāmodarasena was born in 417 A.D., he could not have started to rule independently in 435 A.D. as in that year he was still a minor, if he assume that he reached his majority at 21, as proposed by Majumdar, — from 417 A.D. to 435 A.D. = 18 years. His birth date cannot be pushed back in any case in view of the fact that, according to Majumdar, Divākarasena ruled for 15 years under the regency of Prabhāvatīguptā — from 420 A.D., the commencement of the regency, to 414 A.D., the birth of Divākarasene = 7 years + 15 years, the duration of regency = 21 years. In fact Divākarasena would have been born after 414 A.D., i.e. in 416-17 A.D. and his younger brother in 419-20 A.D. We cannot accept the other alternative suggested by Majumdar that Divākarasena had assumed the coronation name Dāmodarasena and ruled independently from 435 A.D. to 450 A.D.[74] The learned scholar himself accepts that the Rithapur charter was issued in the 19th regnal year of Pravarasena II.[75] If the name of Pravarasena is not mentioned in the record issued in the *Yuvarājaśāsana* of Divākarasena, then the name of *Divākarasena alias* Dāmodarasena should not have been recorded in the grant issued when Pravarasena II was on the throne; besides which, on this hypothesis, the dead king was called Mahārāja and the reigning monarch was not. Therefore, it seems that Dāmodarasena was not the coronation name of Divākarasena but the precoronation name of Pravarasena II.

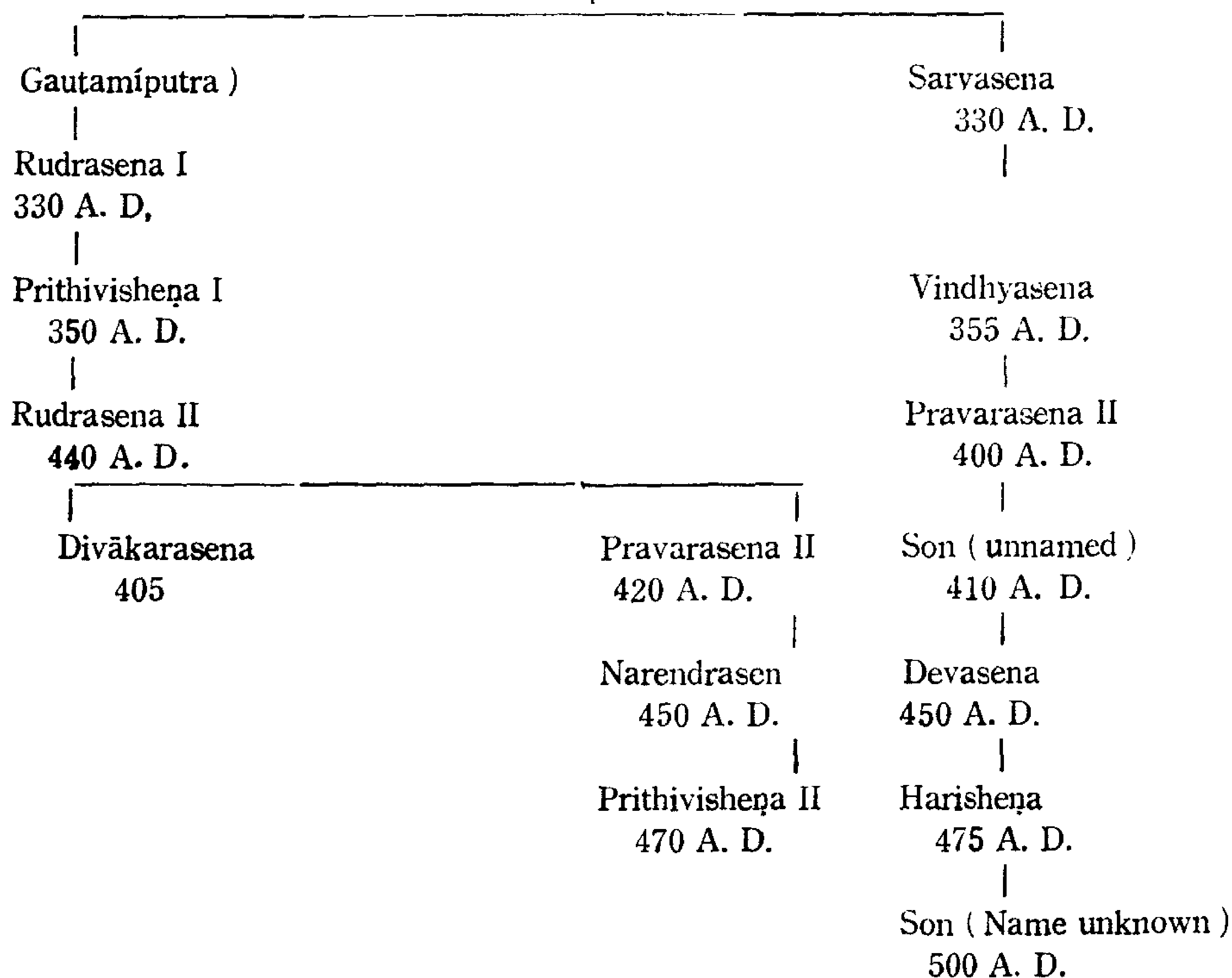
Majumdar further writes that the rule of Budhagupta and his cousin Narendrasena would have ended at the same time.[76] This contention is based on the fact that both of them belonged to the third generation from Chandragupta II. Now it has been established that between Chandragupta II and Budhagupta, Kumāragupta I, Purugupta, Skandagupta and Kumāragupta II ascended the Gupta throne,[77] though it is true that two successors of Chandragupta II, Purugupta and Kumāragupta II had short reigns. Further, the mere fact that they belonged to the same generation need not mean that they ended their rule at the same time. Therefore we agree that Narendrasena and Buddhagupta were contemporaries rather than they ceased to reign simultaneously.

Mirashi, challenging the chronological structure proposed by Majumdar, put forward another chronology as follows :[78]

Vindhyaśakti
250 A. D.

Pravarasena I
270 A. D.

Main Branch **Basim Branch**



Hhis theory is based on two points : first, the contemporaneity of Rudrasena II, and second, the identification of Vyāghradeva of Nachna and Ganj inscriptions, who calls himself the feudatory of Prithivīshena with Vyāghra of the Uchchakalpa dynasty and the feudatory of Prithivīshena II.[79]

This, first is an established fact. According to Smith the matrimonial alliance between the Vākāṭakas and the Guptas was established by Chandragupta II when he marched against the Śakas in c.395 A.D.[80] It is to be noted that 'in 386 A.D. or soon after we find Rudrasiṁha III on the throne ruling as Mahākshatrapa,[81] and therefore this prince appears to have continued upto the end of the 4th century A.D.[82] The matrimonial alliance with the Guptas was not established by Rudrasena II.[83] All the Vākāṭaka princes except Rudrasena II and Prithvīshena II, the last

ruler of the main branch, were Śaivas.[84] But the statement occurs in the records that Rudrasena got the throne by the blessings of Chakrapāṇi[85] or Vishṇu. This change of religious belief itself points to the influence of his wife Prabhāvatīguptā, who was proud of being a devotee of Vishṇu,[86] prior to his accession. The strength of the Vākāṭakas raised by Prithivīsheṇa I who is styled in the characters — *sauryya-vikrama, dharmavijayitava* and *Yudhishṭhira-vṛitte* :[87] led Chandragupta II to think it advisable to establish a matrimonial alliance with Prithivīsheṇa I — his senior contemporary — by giving his daughter Prabhāvatīguptā to his son Rudrasena II rather than to adopt oppressive measures. Thus Chandragupta's son-in-law, Rudrasena was his junior contemporary.

Mirashi's identification of Vyāghradeva of the Nachna and Ganj inscriptions mean that the same king of the Uchchalalpa dynsty was ruling from 470 to 490 A.D. at the time of Prithivīsheṇa II. This view is reputed by Altekar[88] and Raychaudhuri[89] because "the princes of the region which intervenes between Nachna and Ganj and the proper Vākāṭaka territory owned the sway of Gupta "emperors down at least to 528 A.D. Sircar rightly holds : "The palaeographical pecularities of the Nachna and Ganj inscriptions are undoubtedly earlier than those exhibited even by the Basim grant of Vindhyaśakti II, a grandson of Pravarasent I; cf. the triangular form of *va.* and the old form of *ta.* and *ja.*"[90] Admittedly "the letters incised on stone sometime exhibit earlier forms than those engraved on metal plates, it is almost impossible to believe that the Nachna and Ganj records are latter than the age of Pravarasent II, grandson of Chandragupta II and grandfather of Prithivīsheṇa II."[91] Further, it may be mentioned that Vyāghradeva in his records is said to be 'meditating on the feet' of (pādānudhyāta)[92] or 'favoured' by.[93] the overlord. The same expression is used in the Udaigiri cave record by a Sanakānīka chief to acknowledge his overlord Chandragupta II.[94] It became a traditional phrase to show the relationship of father and son in the times of Skandagupta and his successors. This was also commonly used by the kings of the other dynasties to show their relationship with their predecessors. Therefore, the Nachna and Ganj records may chronologically be placed near the Udaigiri cave epigraph.

It is claimed in the Balaghat copper plates that 'Narendrasena's command was honoured by Kosala, Mekala and Mālwa.[95] The last region was part of the Gupta empires[96] at least till the time of Skandagupta,[97] i.e. 467 A.D. and therefore this region would have been brought under Vākāṭaka influence after this time. Mekala, prior to the rise of the Guptas, was probably under the control of the Meghas. Samudragupta, ousting the Maghas, established his suzereignty over this region.[98] This was under the canopy of the Guptas till the time of Skandagupta, as is attested from his epigraph discovered at Supia.[99] Earlier two Pāṇdava princes known from the Bamhani plates of Bharatabala[100] were the feudatories of the Guptas in this region. Bharatabala and his father

Nāgabala adopted the title of Mahārāja. Therefore the period of the proclamation of the independence of the Pāṇḍavas has to be placed after Skandagupta. This Bamhani grant, issued in the second regnal year of Bharatabala contains the word narendra in a verse of rather obscure character. In the light of the Balaghat plates this appears to refer to the Vākāṭaka king Narendrasena. The reason for recording the name of the overlord in veiled form may be explained on the hypothesis that it was not Bharatabala but his father who had direct obligations to Narendrasena.[101] Hence Narendrasena seems to have flourished after Skandagupta and as the contemporary of both Nāgabala and Bharatabala. If Nāgabala flourished from 460 to 480 and his son from 480 to 500 A.D. Narendrasena can rightly be placed in the later half of the 5th century A.D.[102]

Recently a dated epigraph of Devasena of Basim branch was found from Akola district.[103] This serves as the sheet anchor for the chronology of the Vākāṭakas. It records the repair of a lake called Sudarśana by Devasena in Śaka 380 = 458 A.D. We know that Devasena and Pravarasena II of the main line were the fifth descendants of Pravarasena I but one of their ancestors, Gautamīputra, did not rule. Devasena and Pravarasena II were the sixth kings of their respective houses. But Pravarasena's elder brother had a reign of 13 years, excluding Rudrasena II who is assigned the rule of 10 years as his contemporary Pravarasena II of the Basim branch also has a reigning period of the same duration. Thus Narendrasena appears to have been the earlier contemporary of Devasena and the later contemporary of Harisheṇa.

With the help of these fixed points we can place other kings of this dynasty.

Vindhyaśakti, the founder of the dynasty, is placed in 250 A.D., 'almost immediately after the end of the Sātavāhana dynasty'.[104] Majumdar writes: "As Pravarasena is stated in the Puranas to have ruled for sixty years, it is unlikely that Vindhyaśakti also had a long reign. Hence his reign has been assumed to be 20 years."[105] Mirashi agrees with this.[106] But a passage in the Puranas says that Vindyaśakti 'after having known 96 years will enter upon the earth."[107] Mirashi thinks that this figure denotes his age.[108] If this is so then he carved out an independent principality at the age of 76. Is it likely that he could have done this at such an advanced age ? For an active life even Majumdar is hesitant to accept the age of 65.[109] Hence he may be credited with a rule of 30 years.

Pravarasena according to the Puranas ruled for sixty years. The epigraphs also tell us that he was succeeded by grandson; his son Gautamīputra is not associated with the title, Mahārāja.[110] The fact that Gautamīputra did not rule, srengthens the Purāṇic tradition that Pravarasena I had an unusually long reign. Majumdar rightly observes that 'considering his extensive conquests and the performance of *Aśvamedha* sacrifices, the Puranic statement may be accepted as fairly correct.[111]

Rudrasena I would have ruled for a good time as he succeeded his grandfather. Prithivīsheṇa I, the son and successor of Rudrasena I, is said to have living sons and grandsons.[112] Hence he may also have ruled for a good period. Rudrasena II is assigned a period of 5 years by Mirashi with the view that at the time of his death his elder son Divākarasena was a minor. Similar was the case with Pravarasena II and his son of the Basim branch, but the former is allotted the duration of 10 years by Mirashi himself. Majumdar assigns periods of twenty years to both Rudrasena II and Pravarasena II of the Basim branch. Possibly Rudrasena II was married about 400 A.D. He appears to have occupied the throne after a few year of this celebration, say about 405 A.D. Therefore we may assign him a period of ten years for his reign. Against this it may be pointed out that if Rudrasena II was married about 400 A.D. and died in 415 A.D., Divakārasena cannot have acted as *yuvarāja* until his 13th year because his minority, accepting that it ended in his 16th year, must have terminated a few years after the death of his father. But it is to be remembered that a king's first issue need not be a male.

Divākarasena had not reached his majority in his 13th year therefore he seems to have been born not before 412-12 A.D. Probably he was not alive after the issue of the Poona plates and therefore could not rule as king. In the Rithapur grant Pravarasena II is also called Dāmodarasena. The latter seems to have been his pre-coronation name. The recording of such a name along with the coronation name may imply that Pravarasena acted as *yuvarāja* for sometime with the name Dāmodarasena under the regency of his mother Prabhāvatīguptā. If Divākarasena did not survive his 13th year of *yuvarāja* rule, then we have sufficient ground to believe that at the time of the death of Divākarasena in 428 A.D. his younger brother Pravarasena II had not attained the age of the major, i.e. 16 years, as he was born in 415 A.D. the latter had to act as *yuvarāja* under his mothei Prabhāvatīguptā. When he reached the age of majority in 431 A.D. he ascended the throne, calling himself Pravarasena. Pravarasena dated his inscriptions in regnal years from the time of coronation otherwise he would have called himself Dāmodarasena in his Kothuraka grant issued in his second regnal year,[113] if his regnal year commenced from the time of his yuvarajaship. He ruled nearly 30 years, as his last grant is dated in his 29th regnal year.[114]

Pravarasena II was succeeded by his son Narendrasena and then by his grandson Prithivīsheṇa II. Pravarasena was born in 415 A.D. and therefore his son would have born about 435 A.D. Narendrasena, at the death of his father in 460 A.D., was quite young, of the age of 25 years. Therefore, he also might have ruled for thirty years. Prithivīsheṇa II, if he was born in 455 A.D. at the time of his father's death in 490 A.D. would not have been quite as young as his father when the latter came to the throne, and hence he seems to have ruled for a period of twenty years.

About the chronology of the Basim branch, Majumdar and Mirashi differ from each other. The main controversy concerns Harisheṇa; according to the former he preceded while in the view of the latter he followed Prithivīsheṇa II.

Majumdar puts forward two arguments[115] in favour of his theory :

1. Narendrasena and Harisheṇa were both sixth descendants from Pravarasena I.

2. From the Ajanta record it appears that Harisheṇa for a while occupied the territory of the main branch. On the other hand, it is known from the Balaghat inscription of Prithivīsheṇa II that he rescued the fortunes of his family. Hence Harisheṇa ruled before Prithivīsheṇa II and was the contemporary of Narendrasena.

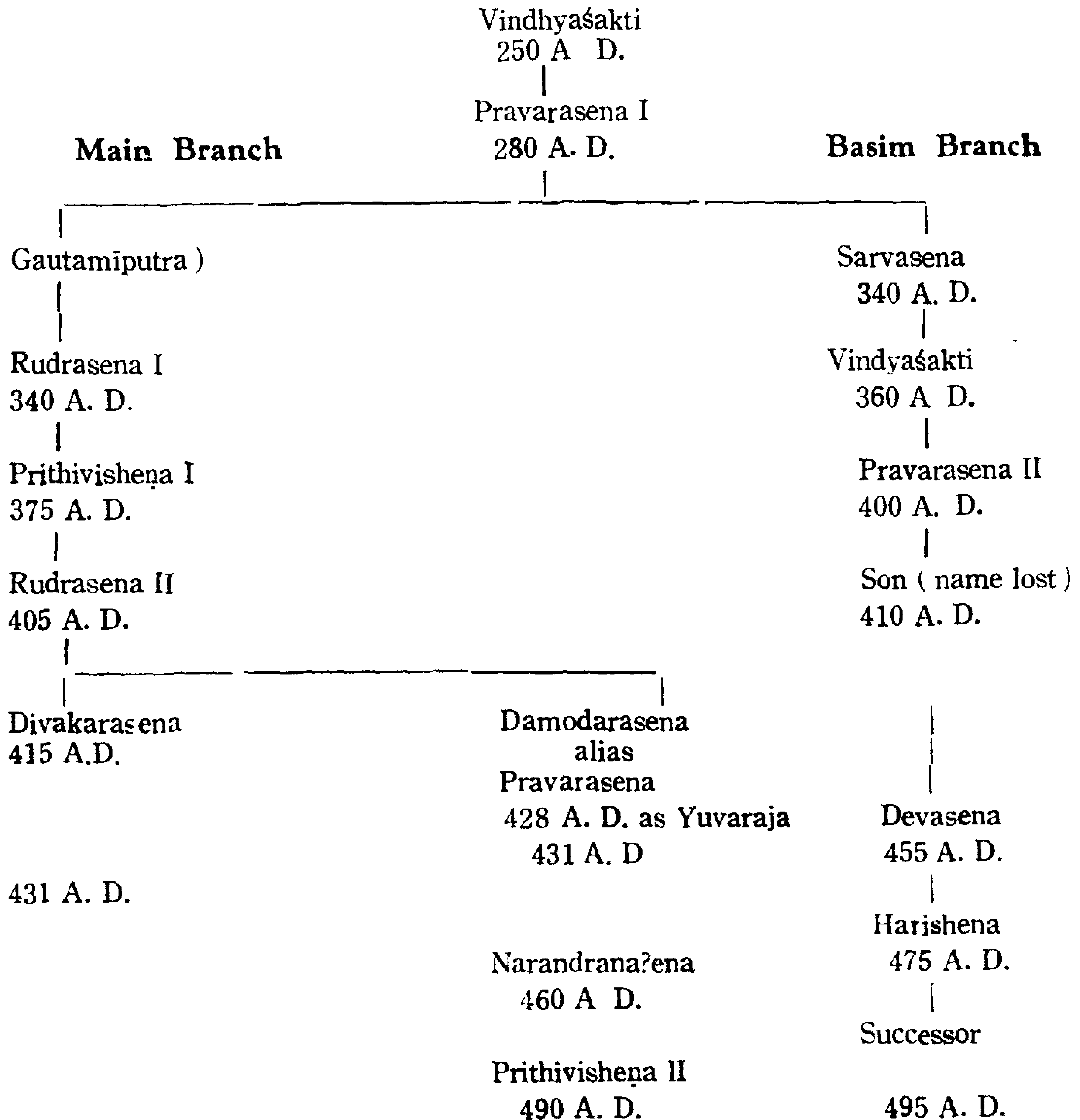
Mirashi, refuting his first arguement, says "we cannot however be certain about the contemporaneity of the princes by counting generations as the reign — periods of kings vary greatly." We should also remember the fact that, "though Narendrasena was sixth in descent from Pravarasena I, one of his ancestors, viz., Gautamīputra did not reign. Narendrasena was therefore probably a contemporary of Devasena."[116] However, it may be also recalled that Narendrasena and Harisheṇa were the sixth rulers of their lines after Pravarasena I. But it is also known that the elder brother of Narendrasena's father had a reign of 13 years. Therefore Narendrasena seems to have been the contemporary of both, Devasena and Harisheṇa and we know from the record of Devasena which is dated 458 A.D.[117] discovered recently, that he flourished in the beginning of the latter half of the 5th century A.D.

On the claim of Prithivīsheṇa II to have rescued the fallen prestige of his family,[118] Mirashi further writes that "we know that there were wars between the main branch of the Vākāṭakas and he Nalas of Pushkhari. Bhavadatta Varman of the Nala dynasty had overrun the Vākāṭaka territory and occupied Nandivardhana, the erstwhile capital of the Vākāṭakas. The Nalas admit that their own capital was devasted by he enemy sometimes before the reign of Skandavarman, the son of Bhavadattavarman, who resettled it." Therefore this claim actually "refers to the reoccupation of Northern Vidarbha by Prithivīsheṇa II."[119] The statement of the Balaghat epigraph that Prithivīsheṇa twice rescued the fallen fortune of his family may be taken to record two events; one to the reconquest of the North Vidarbha from the Nalas and the other to the defeat of Harisheṇa, who had overrun the Vākāṭaka territories in the time of Narendrasena.

Sarvasena succeeded in establishing his own line by dividing the Vākāṭaka empire after the death of his father Pravarasena.[120] As his father ruled for sixty years, his reign would not have been a long one. Vindhyaśkti, his son and successor, issued a grant in his 37th regnal year[121] and hence he must have

ruled at least for 40 years. His son Pravarasena did not rule for a long time. Mirashi rightly attributes to him a period of 10 years, because his son ascended the throne at the age of 8 years.[122] The son of Pravarasena II (name lost) occupied the throne in his boyhood and therefore he would have ruled for a considerable time. His son Devasena may be assigned a period of twenty years. His epigraph dated in 458 A.D.[123] helps us in placing him in the later part of the 5th century A.D. His son Harisheṇa also appears to have ruled for the same time. He was probably succeeded by a prince known from Daṇḍī's *Daśakumāracharita.*

Thus the genealogy and the chronology of the two houses of the Vākāṭakas may be tabulated as given here below.



REFERENCES

1. *The Vākāṭaka-Gupta Age,* 1964, pp. 87 ff.
2. *The Vākāṭaka-Gupta Age,* 1954, p. 87.
3. *Ibid.,* p. 102.
4. *Ibid.,* p. 102, n. 1.
5. *Ibid.*
6. *Ibid.,* p. 125.
7. *Ibid.,* p. 102, n. 1.
8. *JASBL,* XII, 2, p. 71.
9. *Ibid.*
10. *JASBL,* XII, 1, p. 1.
11. *Ibid.,* p. 7.
12. *Ibid.,* pp. 1-5.
13. *JPASB,* XX, p. 53.
14. *JASBL,* XII, 1, p. 1.
15. *JUPHS,* XIII, p. 97.
16. *The Classical Age,* p. 180, n. 3.
17. *Proc. IHG,* 1947, p. 86.
18. वाकाटक राजवंश का इतिहास तथा अभिलेख, पृ. 160
19. *CII,* V, p. 35.
20. *Ibid.,* p. 34.
21. *PIHC,* 1947, p. 47.
22. *The Coinage of the Gupta Empire,* pp. 47-48.
23. *Ibid.,* p. 48.
24. *CII,* III, pp. 6ff.
25. *CII,* V, p. 37.
26. Sircar observes that 'Prabhāvatīguptā's death does not appear to have occurred long before the end of the rule of her aged brother Kumāragupta I', *The Classical Age,* p. 181.
27. *JASBL,* XII, 1, p. 2.
28. *Ibid.*
29. *Ibid.*
30. *Ibid.,* p. 3.
31. *CII,* III, p. 43.
32. *JBORS,* XIV, pp. 223ff; XV, pp. 134ff; XVIII, pp. 17ff; *Malaviya Commemoration Volume,* pp. 189ff; *The Age of the Imperial Guptas,* p. 26.
33. *CII,* III, p. 43.
34. Sinha, B. P., *The Decline of the Kingdom of Magadha,* p. 30.
35. *The Vākāṭaka-Gupta Age,* 1954, p. 162.
36. *IHQ.* XIX, p. 274.
37. Sinha, *op. cit.,* p. 30.
    Poona copper plates, but not in the Rithapur copper plates of Prabhāvatīguptā (*Ibid.,* p. 171).
38. वाकाटक राजवंश का इतिहास तथा अभिलेख पृ. 138
39. Sinha, *op. cit.,* p. 31.
40. *JASBL,* XII, 1, p. 2.
41. *CII,* III, p. 20.
42. *The Classical Age.* p. 21. *The Vākāṭaka-Gupta Age,* 1954, pp. 155-6.
43. The Mathura Pillar Inscription of Chandragupta II dated in 61 of the Gupta Era = 380 A.D. also provides his regnal year which is read either as *prathama* or *pañchama* (*Selected Inscription,* 1965, 277). The latter is most possible (*The Classical Age,* p. 18; *The Vākāṭaka-Gupta Age,* 1954, p. 153).

46. *CII*, IV, p. xlii. It is stated in the Mahākuta inscription dated in 602 A.D. that the Chālukya king Mangaleśa defeated the King Buddha (*IA*, XIX, pp. 17-18) who is clearly called the Kalachuri and the son of Śankaragaṇa in Nerur plates (*IA*, VIII, pp. 161ff.) and Aihole inscription (*EI*, VI, pp. 1ffff.). Therefore, Krishṇarāja and his son Śankaragaṇa have to be placed in the second half of the sixth century A.D.
47. *CII*, IV, p. clxxxii.
48. *Ibid.*, p. xlvii.
48a. Prithivīsheṇa II issued the Balaghat copper plates when he encamped at Vembāra This place is identified by Mirashi with Bembal about 28 miles to the east of Chanda (*EI*, XXII, p. 210, n. 6).
48a. A hoard containing coins of Prasannamātra is discovered from village Bhandara in Chanda district (*JNSI*, XVI, pt. II, pp. 215 ff.).
48c. In a hoard the coins of Prasannamātra occur along with a coin of Vishṇugupta (*ASI, AR*, 1926-27, p. 230) who ruled upto 550 A.D.
49. *JASBL*, XII, i, p. 3.
50. *Ibid.*, p. 3.
51. The charter issued in this year calls him *yuvaraja*.
52. *PIHC*, 1947, p. 87.
53. *JASBL*, XII, 1, p. 2.
54. *JASBL*, XII, 2, p. 71.
56. *Ibid.*, p. 75.
55. *Ibid.*, XII, pp. 71-72.
57. *JASBL*, XIII, 2, p. 75.
58. *Ibid.*
59. *Ibid.*, p. 76.
60. *History of Dharmaśastra*, III, p. 573.
61. *JASBL*, XII, 1, p. 4.
62. *Ibid.*, p. 5.
63. I am indebted to Prof. A. L. Basham for this suggestion.
64. *JASBL*, XII, 1, p. 3.
65. *Ibid.*, p. 4.
66. *The Classical Age*, p. 180, f.n.2.
67. वाकाटक राजवंशका इतिहास तथा अभिलेख, पृ. 163
68. *PIHC*, 1947, p. 80.
69. वाकाटक राजवंशका इतिहास तथा अभिलेख, पृ. 162
70. *Ibid.*, p. 139.
71. *Supra.*
72. *JASBL*, XII, 1, p. 5.
73. *Ibid.*
74. *Ibid.*, pp. 3-4.
75. *Ibid.*, p. 3.
76. *Ibid.*, p. 4.
77. Sinha, B. P., *The Decline of the Kingdom of Magadha*. pp. 41 ff.
78. *PIHC*, 1947, p. 90.
80. *Early History of India*, p. 307.
81. *The Vākāṭaka-Gupta Age*, p. 58.

82. There is no evidence to show that the Western Kshatrapas were ousted before 400 A.D.
83. Altekar observes that Chandragupta II "proposed a matrimonial alliance to Prithivīsheṇa by offering his daughter Prabhāvatīguptā in marriage to the Vākāṭaka crown prince Rudrasena" *The Vākāṭaka-Gupta Age*, 1954, p. 102.

84. वाकाटक राजवंशका इतिहास तथा अभिलेख, पृ. 36
85. भगवत् चक्रपाणेः प्रसादो पार्जितसमुययस्य महाराज श्री रुद्रसेनस्य. CII., p. 237
86. *CII*, III, p. 237
87. वाकाटक राजवंश का इतिहास तथा अभिलेख पृ. 138
88 *The Vākāṭaka-Gupta Age*, p. 101, f.n.3.
89. *Political History of Northern India*. p. 455.
90. *The Classical Age*, p. 174, p. 1.
91. *JASBL*, XII, 2, p. 73.
92. *CII*, III, p. 25.
93. *IHQ* XVIII, p. 64.
94. *CII*, III, p. 234.
95. *EI*, IX, pp. 267 ff.
96. *The Classical Age*, pp. 32, 184.
97. Majumdar writes that Western Malwa was "a feudatory state under Skandagupta" (*The Vākāṭaka-Gupta Age*, 1954, p. 168).
98. *Studies in Indology*, p. 216.
99. *EI*, XXXIII, Pt. VII, pp. 306 ff.
100. *EI*, XXVII, pp. 132 ff.
101. Cf. 'A Study of Rithapur, Bamhani and Balaghat copper plates', to be published elsewhere.
102. For a detailed discussion, see my paper, 'The Pandavas of Mekala', to be published in R. K. Mookerji Commemoration Volume.
103. *EI*, XXXVII, pt.1, p. 1ff.; *JAIH*, pp. 94ff; *Indian History Congress, Thirty First-Session, Summaries of Papers*, 1969, pp. 4-5.
104. *JASBL*, XII, 1, p. 5; *The Vākātaka-Gupta Age*, pp. 86-87.
105. *JASBL*. XII, 1, p. 5.
106. *PIHC*, 1947, p. 90.
107. Pargiter, F. E., *The Purana Text of the Dynasties of the Kali Age*, p. 48.
108. वाकाटक राजवंश का इतिहास तथा अभिलेख P. 6
109. *JASBL*, XII, 1, p. 3.
110. *The Vākāṭaka-Gupta Age*, p. 94;
111. *JASBL*, XII, 1, p. 5.
112. वाकाटका राजवंश का इतिहास तथ, अभिलेख p.188
113. *EI*, *XXVI*, pp.155f.
114. *Ibid*, p. 145.
115. *JASBL*, XII, 1, p. 4.
116. *PIHC*, 1947, p. 88.
117. *JAIH*, 1, p. 94ff.
119. *PIHC*, 1947, p. 89.
118. *EI*. IX, pp. 267ff.
120. वाकाटक राजवंश का इतिहास तथा अभिलेख पृ 25
121. *Ibid*, p. 250.
122. *Ibid*, pp. 9, 40, 261.
123. *Ibid*, pp. 43ff.
124. *JAIH*, I, pp. 94ff.

THE BLADE-TOOL INDUSTRY OF SHORAPUR DOAB, PENINSULAR INDIA

K. PADDAYYA

I. *Introduction*

FROM A cursory examination of the Palaeolithic culture-sequence in Europe, Western Asia and northern part of Africa, it immediately becomes apparent that the flake-tool cultures of the Levalloise-Mousterian complex were everywhere superseded by what are called the blade cultures. These new cultures belong to the later part of Upper Pleistocene, i.e. *c.* 35,000 to 10,000 B.C., and are termed variously as the Upper Palaeolithic, Epi-Palaeolithic, Late Palaeolithic and Advanced Palaeolithic.[1] Both as regards the authorship and the stone-working tradition, they are distinctly different from the preceding flake cultures. The latter ones are based on the working of flakes and associated with populations of the Neanderthal stock. In contradistinction to this, the new cultures are found in association with the skeletal remains of *Homo sapiens;* what is more important, the stone-working tradition undergoes a complete transformation in as much as the flakes are now replaced by blades as the leading primary product. The other important innovatory traits associated with these blade cultures are : (1) the coming into vogue of the tradition of working bone, ivory and antler, aside from stone; (2) the occurrence of burinate tools as an integral component of the tool-kit; (3) the invention of the tradition of composite tools; and (4) the practice of art on an exuberant scale and in diverse ways. Considered as a whole, these cultures represent the climax of human achievement in the Palaeolithic culture-sequence. As has been ably summed up by CLARK and PIGGOTT (1965, 97), "Both conceptually and physically the Advanced Palaeolithic peoples were true representatives of modern men, who tried it as it were for the first time the faculties by which during the astonishingly brief period of 10,000 years were shaped all the diversities and intricacies of civilization itself."

Turning to the situation in the Indian sub-continent, we are faced with a somewhat different phenomenon. Unlike in Europe, Western Asia and Africa, in most parts of the country the flake industries of the Middle Stone Age complex seem to have been followed directly by the Late Stone Age microlithic

industries. The evidence for interposal of industries of the blade-tool facies between the two aforenamed industrial complexes is not only exceedingly meagre but the industries themselves are of an ill-defined type as compared to their counterparts elsewhere. Blade-tool assemblages were first reported from Kurnool in Andhra Pradesh (CAMMIADE and BURKITT, 1930, 338-9) and Khandivli near Bombay (TODD, 1939, 261) as far back as the forties of the present century. Later ISAAC (1960) adduced some more evidence from the Kurnool area, while SANKALIA (1962, 119) disproved the independent status accorded by Todd to the Khandivili assemblage. During the last decade or so a few more assemblages have been recorded from Nagarjuakonda in Andhra Pradesh (SOUNDARA RAJAN, 1958, 59-60), the Singhbhum district in Bihar (GHOSH, 1965), the Banjer river in the Mandla district of Madhya Pradesh (GHOSH, 1961) and the Belan river in Uttar Pradesh (SHARMA, *et. al.*, 1968, 5). Still more recently, MURTY (1968, 83-101) has discovered a distinctive industry in the Chittoor district of Andhra Pradesh. It thus appears that blade-tool industries comparable to those of the Upper Palaeolithic of Europe, Western Asia and Africa have but a limited distribution in our country. It is in this regard the identification of yet another industry in the Shorapur-Doab of Mysore State assumes a measure of importance and thereby adds to our knowledge of the Stone culture-sequence of the country.

II. Sites, Stratigraphy and Chronology

The Shorapur Doab consists of a beak-shaped tract of country formed by the confluence of the Krishna and Bhima rivers, and lies in the south-western corner of the Gulbarga district. The sites relevant to the present study, occurring along the boundary between the Doab and the Muddebihal taluk (Bijapur district) lying to the west are situated about 22 miles[2] west of the taluk headquarters of Shorapur.

The occurrence of a blade-tool industry in this area was first brought to light by the discovery made by Sundara (IAR, 1960-61, 28) of a workshop site at a place named Salvadgi (Long, 76° 25′ and Late 16° 27′) lying in the revenue limits of the Muddebihal taluk. This place is situated about the 1700 feet contour on a waterdivide formed by limestone plateau. The plateau is thickly covered with black cotton soil. The Stone Age workshop, situated in a cultivated field locally known as the *Horpatiyavara Hola,* covers an area of about 2 acres and lies about 1½ miles due west of the village and 2 furlongs south of the Talikot-Shorapur road. The field houses outcrops of chert occurring in the form of discontinuous patches in the limestone. Subsequent to its discovery by Sundara, Seshadri visited the site and made a descriptive study of the artefactual material collected on surface. Basing purely on typo-technological criteria, he postulated the presence of two different industrial traditions at this site, viz. a flake and flake-blade industry of the Middle Stone Age

complex and a true blade-tool industry of the Upper Palaeolithic type (SESHADRI, 1962).

In the course of a comprehensive work on the pre- and proto-historic remains of the Doab, the writer (1968) discovered another workshop site at a place called Meralbhavi (MBV-1) lying about 2 miles south of Salvadgi. This workshop, lying in a cultivated field locally called the *Manegidu Hola* and housing outcrops of chert, is situated about a mile west of the village. It is more extensive than the one at Salvadgi and covers an area of about 7 to 8 acres. As at Salvadgi, the artefacts were found in a mixed condition at this site also. Among a grab-collection of 963 examples, 321 specimens were found to be waste products, 196 were of the Middle Stone Age industry and the remaining 446 examples of the blade-tool industry.

The presence of two distinct industries, though sounded true on typo-technological grounds, still remained a hypothetical issue, since the artefacts were found in a mixed condition at both the sites. The 'two-industries' theory thus needed to be evaluated in the light of stratigraphical data. Therefore, a trial pit, measuring 4 × 4 feet, was first dug by the writer in the field housing the workshop at Salvadgi (SVG-1). The arefacts were found to occur in diminishing quantities up to a depth of 2 feet in a matrix of black sticky soil. As detailed below, a total number of 767 specimens were recorded from this dig; of these 49 examples were of the Middle Age industry, 176 of the blade-tool

Level	Flake and flake-blade artefacts	Blade artefacts	Waste products	Total
Surface	26	94	175	295
1 to 11 inches	19	39	199	257
11 to 18 inches	3	25	116	144
18 to 24 inches	1	18	52	71
TOTAL	49	176	542	767

industry and the rest waste products. This trial excavation, however, proved to be of no help because the artefacts were again found to occur in a mixed state. Indeed it was not entirely unexpected because the site is only a workshop and also because it is being subjected to the action of plough every year.

Having thus failed to obtain any tangible evidence at the workshop sites, recourse was inevitably made to the examination of river stratigraphy. The Don river and its tributaries, lying to the west of the limestone plateau, were explored for this purpose. About half a furlong south of the workshop at Salvadgi, a small section (SVG-2) was noted on a contributory stream of the Don river. The right bank preserved a 2 feet thick deposit of black brown silt (Pl. XIII, a). The deposit was kankary and found mixed up with chert nodules. Sixteen artefacts (5 *in situ* and the rest loose) were obtained from this locality. Excepting two examples of the flake complex, all of them belong to the blade-tool industry. On the Don river itself stratified sites of the Middle Stone Age industry were discovered at Hurhatti and Hegratgi.[3] The stratigraphy observed at these places showed a succession of bedrock, gravel horizon and black brown silt. The gravel layers yielded artefacts typical of the Middle Stone Age industry. Blade artefacts were found to be almost completely absent in the assemblages.

During the early part of 1969 the writer obtained further and more important stratigraphical data through the discovery of a larger number of stratified sites on the Hunsgi nullah and its tributaries lying to the eastern side of the Salvadgi-Meralbhavi plateau. Without going into much details, it may be noted that the stratigraphical column revealed a five-tier succession of bedrock, Early Stone Age tool-bearing bouldery gravel, pebbly cobbly gravel yielding Middle Stone Age artefacts, yellow brown silt and black brown silt. So far as the present study is confined, significant evidence was obtained from four sites named after the villages of Meralbhavi (Localities 2 and 3), Gulbal, Benhatti and Hunsgi, all lying within a reach of 4 to 5 miles from the workshops at Salvadgi and Meralbhavi. At all these sites the stratum consisting of black brown silt was found to possess within it lenses (about 10 inches in thickness) of loose pebbly granular gravel (pl. XIII b). These lenses yielded aftefacts exclusively of the blade-tool industry comprising fluted cores, blades, burins, etc. Black brown silt, representing the alluvial variety of black cotton soil, was thus proved to be the horizon of the blade-tool industry. We may also take note of the fact that artefacts of the Late Stone Age industry were found to occur at several places on the top of the terrace formed by the black brown silt.

From the foregoing account it is clear that the Early Stone Age, Middle Stone Age, blade-tool and Late Stone Age industries of this area possess independent stratigraphical statuses and as such need to be regarded as belonging to disparate chronological horizons. This in turn confirms our view that the sites at Salvadgi-1 and Meralbhavi-1 served as workshops for two distinct stone-working tradiions – one characterised by the manufacture of scraper-point-borer category of tools on fllakes and fllake-blades and the other by the production of blade tools.[4] This is hardly surprising because at both the places the raw materials occurs is unlimited quantities in the form of chert interbeddings in the limestone. As to the blade-tool industry, the stratigraphical data clearly

prove that it occupies an intermediary position between the Middle Stone Age and the Late Stone Age industries.

Now a few remarks about the dating of the industries. If the typo-technological similarities are any guide, the dating of the Early Stone Age industries of India, recommended on the basis of palaeontological data, to the late Middle Pleistocene or early Upper Pleistocene perhaps holds good in the case of our industry also. The Middle Stone Age industry is generally thought to belong to the Upper Pleistocene. This dating is confirmed by the findings made recently at Rahuri (Boregaon Nandur) on the Mula river in the Ahmadnagar district of Maharashtra. Semi-carbonized logs of *Terminalia Arjuna* found along with the fossils of *Bos* and a few stone artefacts in a buried portion of alluvium have produced the radiocarbon determination of C. 33,000 years B.P. (RAJAGURU, 1969). Hence, the Middle Stone Age industry of our area also may be assigned to the Upper Pleistocene. Since the black brown silt overlies the Middle Stone Age gravels, it follows that the formation of this deposit took place in post-Pleistocene times. The junction between this silt and the underlying yellow brown silt is not clear, which would mean that the former was formed by the weahering *in situ* of the later deposit. Reference needs to be made here to the fossil soils identified at Nevasa in Maharashtra (MUJUMDAR and RAJAGURU, 1965, 252) and Kupgal in the Bellary district of Mysore State (MUJUMDAR and RAJAGURU, 1966, 29-43). The one found at Nevasa is blackish and was formed by the weathering of the yellow silt deposited by the Pravara river; the one at Kupgal is reddish brown yellowish red in colour and was formed over granite detritus. These soils underlie the Neolithic-Chalcolithic deposits and, therefore, dated to the Sub-Recent period. Basing on these comparative data on soils and also allowing for a certain amount of time-lag between the actual date of manufacture of implements and their subsequent dispersal through geomorphic agencies, the blade-tool industry of this area may be assigned to a period encompassing the terminal phase of Upper Pleistocene and the early part of the Sub-Recent period. The dating of the Late Stone Age industry should necessarily await the finding of some more data. The occurrence of artefacts exclusively on the surface of the black brown silt, however, clearly suggests that this industry belongs to a period laster than that of the blade-tool industry. Taking into consideration the occurrence of artefacts below the Neolithic levels at Sanganakal (SANKALIA, 1969), this industry could be provisionally dated to the latter part of the Sub-Recent period.

III. The Industry

GENERAL FEATURES

The present study is confined to three blade-tool assemblages: the collections from the trial excavation (SVG-1) and nullah section (SVG-2) at Salvadgi

and the assemblage from the workshop at Meralbhavi (MBV-1), the numerical orders of artefacts being 176, 16 and 446 respectively. The flake and flake-blade assemblages from SVG-1 and MBV-1 have already been studied by the writer (1968). The blade-tool assemblages from the stratified sites of Meralbhavi-2 and 3, Gulbal, Benhatti and Hunsgi are excluded from the study, as they are being worked upon by the writer as part of a comprehensive report on the Stone Age remains of the Hunsgi nullah.

The artefacts are made exclusively of chert. It shows a dense, flint-like textural make-up, and yields perfect conchoidal fracture. This material occurs as thin interbeddings in limestone on the Salvadgi-Meralbhavi plateau. As already mentioned, the ractory sites at both Salvadgi and Meralbhavi are located on the outcrops themselves. The flat-bodied nodules composing these veins are of handy sizes and served as nuclei for the artificer. The nodules bear a rough, whitish cortex, while the inner mass possesses smooth, lustrous appearance. This chert is mostly reddish brown in colour, the minor colours noted being yellow, red and blue. The artefacts are in mint condition and do not show any traces of physical or chemical alteration.

Fluted core technique forms the primary method of flaking employed in this industry. As mentioned above, the flat-bodied nodules of chert from the veins were utilized as nuclei. Selection was usually made of elongated pieces with semi-cylindrical outlines. The whitish cortical matter was first trimmed away, partly or fully, by shallow flaking. One of the ends of the core so dressed was snapped so as to obtain a suitable platform. The platforms are usually plain and formed by single flake-scars, but specimens exhibiting multiple faceting are not lacking altogether. Flaking involving the detachment of blades was generally commenced at one of the corners and thence carried partly or all over the body. It is commonly believed that in the fluted core technique use was probably made of an intermediary — wooden or bone punch — through which the force of blow delivered by a soft hammer passed on the core, ultimately resulting in the detachment of a slender piece. However, it is not unlikely that some of the specimens of the presnt industry, particularly the large and thick-bodied ones, were struck by the direct percussion method. The products obtained through this technique, commonly referred to as blades, are long and narrow with parallel or nearly parallel margins. Their striking platforms are mostly plain, and the bulbs of percussion tiny but prominently developed. The dorsal surface bears one or more length-wise negative flake-scars, whereby revealing that blades were struck in series from one and the same core. Judged as a whole, the technique is rather ill-developed and the standard of craftsmanship could hardly be regarded as approximating the one observable in the Late Stone Age and Neolithic blade industries of the Doab. Some of the blades were subjected to secondary working and fashioned into tools of various types. This working is of three types: (a) strengthening of working ends

by simple trimming (edge-retouch) executed with a pointed piece of bone or wood, (b) steep, protective blunting of margins intended for facilitating the insertion of tools in wooden or bone hafts, and (c) burin faceting involving the removal of thin and narrow slices from the blanks.

From a comparative study it is revealed that this blade-tool industry differs widely from both the Middle Stone Age and Late Stone Age industries of the area. As has already been remarked, the Middle Stone Age industry is based almost exclusively on the working of flakes and flake-blades; on the other hand, the whole range of tools of the present industry are made on true blades. Another important difference bears upon the burinate tools. These tools are conspicuous by their absence in the Middle Stone Age industry; as against this, they occur in a considerable number in the assemblages of the blade-tool industry.

Although both are based on the production of blade tools, there are certain significant differences between the blade-tool and Late Stone Age industries.[5] Firstly, the raw materials selected for working. The chert which also forms the chief medium in the Late Stone Age industry, is totally different from the flinty variety of chert utilised in the present industry. The former one is whitish in colour and was obtained in the form of pebbles from riverine sources. Secondly, the workmanship witnessed in the blade industry is rather inferior and lacks the finesse noted in the assemblages of the Late Stone Age industry, as revealed through features like the inadequate preparation of cores before the detachment of blades, the blunt nature of the margins as opposed to the razor-sharp character of their Late Stone Age counterparts, and the rarity of steep retouch. The third difference concerns the microlithic implements. Such types as lunates, trapezes and triangles are a regular occurrence in the Late Stone Age industry, but they are totally absent in the blade industry. Furtheir the proportion of backed blades is much higher in the Late Stone Age industry. Lastly, the artefacts of the blade industry are much larger in size than those of the Late Stone Age industries. This point could be illustrated by comparing the length measurements of blades in the two industries. The greatest number (24%) of blades in the blade industry measure between 4.1 and 5 centimetres, while corresponding group (49.54%) of specimens in the Late Stone Age industry fall between 2.1 and 3 centimetres. While there are no examples exceeding the class-limit of 5 centimetres in the Late Stone Age industry, the overall proportion of such specimens (with 12 centimetres as the upper class-limit) in the blade-tool industry is as high as 50 per cent.

The differences outlined above permit us to conclude that the blade-tool industry has an individuality of its own and stands apart from other lithic industries identified in the Doab. Both from chronological and typo-technological points of view, it occupies an intermediary position between the Middle and Late Stone Age industries.

TYPOLOGY

The total collection comprises 638 examples. Of these, 262 specimeis (41.63) %) are finished tools and the rest (53.37%) simple artefacts. All the specimens bearing definite signs of secondary working are regarded as finished forms. Simple artefacts include cores, unworked blades, waste products, etc.

A. *Finished Tools*

Taking into consideration the nature of the working or business end, they are divided into three groups: edge tools, non-edge tools and multiple tools. In the edge tools the working end assumes the form of an edge, which may be varied in shape and lie either on the longitudinal margins or traverse to the main axis of the blank selected for working. In the presnt industry the non-edge tools include two types only, viz. points and borers. Multiple tools show a combination of edged and non-edged forms of working ends. The site and group-wise distrivution is given below:

	SVG-1	SVG-2	MBV-1	Total	
I. EDGE TOOLS					
1. Blades (straight edge) a) Single	15	1	32	48	(18.30%)
b) Double	4	–	13	17	(6.87%)
2. Transverse-edged Blades	8	1	12	21	(8.01%)
3. Lateral-cum-transverse edged Blades	2	–	11	13	(4.98%)
4. Notched Blades	6	–	21	27	(10.31%)
5. Lateal edge-cum-notched Blades	–	–	5	5	(:1.91%)
6. Transverse edge-cum notehed Blades	–	–	3	3	(1.14%)
7. Backed Blades	3	–	8	11	(3.84%)
8. Nosed edge Tools	1	–	1	2	(0.76%)
9. Blade Sections	7	–	17	24	(9.16%)
10. Burins	9	1	12	22	(8.39%)
11. Tools on Fluted cores	–	–	2	2	(0.76%)
Total	55	3	137	195	(74.43%)

	(SVG-1)1	SVG-2	MBV-1	Total	
II. NON-EDGE TOOLS					
1. Points					
a) Simple	7	–	30	37	(14.12%)
b) Tanged	1	1	4	6	(2.29%)
2. Borers	4	–	12	16	(6.11%)
Total	12	1	46	59	(22.52%)
III. MULTIPLE TOOLS					
1. Notched blade-com-point	–	–	3	3	(1.14%)
2. Straight edge blade-cum-borer	–	–	5	5	(1.91%)
Total	–	–	8	8	(3.05%)
GRAND Total	67	4	191	262	(100.00)

I. Edged Tools

Eleven types are represented in this group.

1. *Blades* (straight edge)

The working edge is straight or nearly so, and is always located on the lateral margins. Forty-eight specimens bear retouch on one margin and 17 on both the margins.

SVG-1: 27 (fig. 24, No. 1) —Blade with plain platform and prominent bulb; dorsal surface evidencing cross-flaking to the right side of the mid-rib; left margin retouched in a straight line from ventral surface; opposite one fresh. Surface.

4.5 × 2.6 × 1.1.[6]

MBV-1 : 87 (fig. 24, No. 2) — Blade with faceted platform and prominent bulb; dorsal surface with two low ribs; left margin somewhat convex and retouched from ventral surface; opposite one with traces of use-marks.

3.1 × 1.9 × 0.6.

MBV-1 : 179 (fig. 24, No. 3) — Blade with tiny and plain platform and prominent bulb; both the margins retouched in a straight line from ventral surface.

5 × 2.6 × 0.7. :

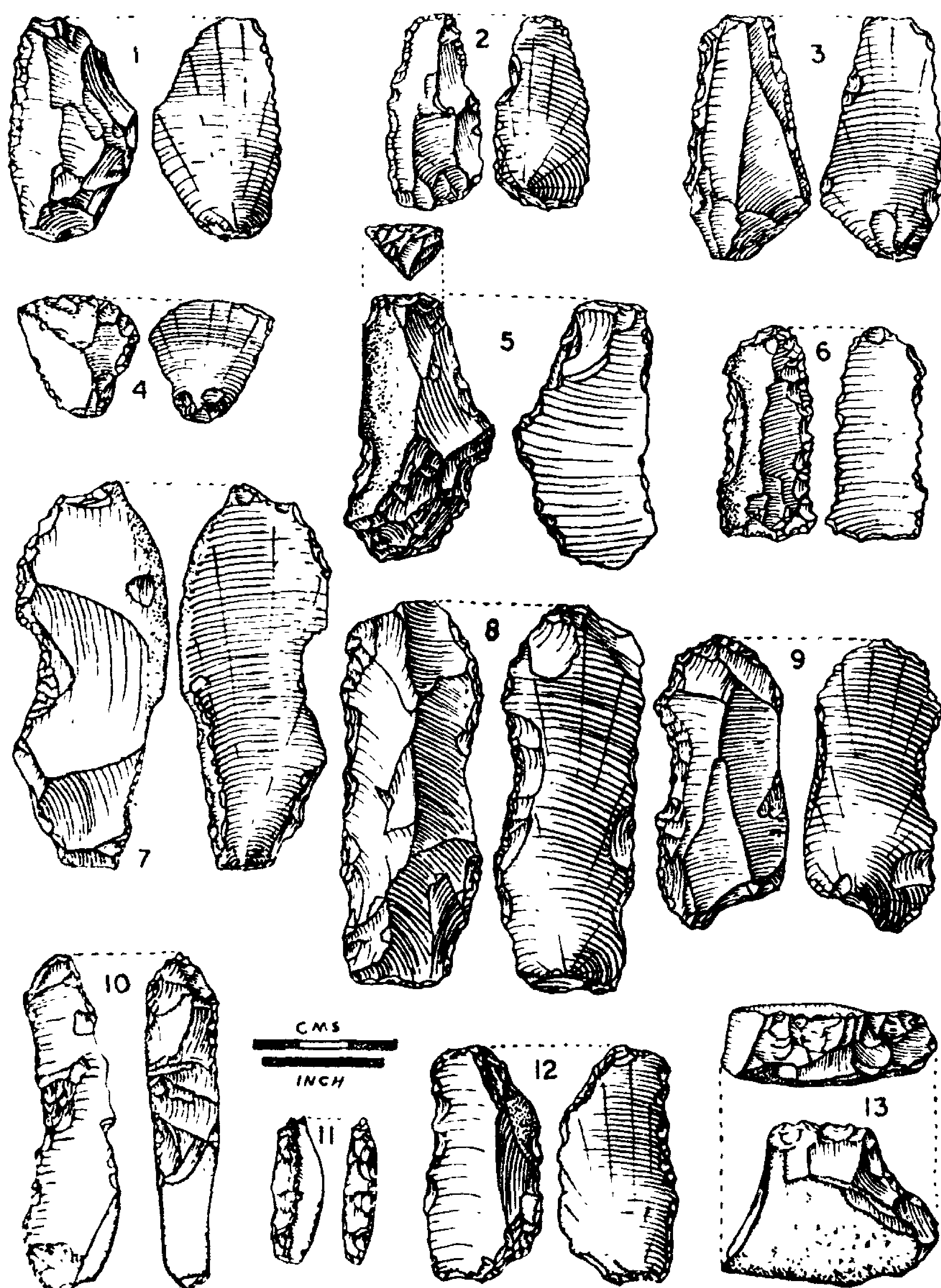


Fig. 24

11. *Tools on fluted cores*

Both the specimens are made on exhausted cores.

MBV-1 : 70 (Fig. 25, No. 23) — Thin core with tabular body bearing flutings; right margin retouched and transformed into a straight working edge. 4.8 × 2.1 × 1.2.

2. *Transverse-edged blades*

Here the working edge is located at the distal end of the blade. It is straight retouch if often executed in a steep fashion.

in 13 specimens and convex or rounded in the remaining 8 examples. The

SVG-1 : 177 (fig. 24, No. 4) — Small triangular blade with plain platform and prominent bulb; distal end retouched to a convex shape from ventral surface. Depth — 1 to 11 inches.

MBV-1 : 118 (fig. 24, No. 5) — Thick blade devoid of both bulb and platform; dorsal surface partly retaining cortex; upper end straight and retouched in a steep manner from ventral surface.

5.4 × 2.9 × 1.3.

3. *Lateral-cum-transeverse-edged blades*

These specimens have one of their margins as also one of the ends retouched. Four specimens are retouched along the two margins as well as at both the ends.

MBV-1 : 853 (fig. 24, No. 6) — Thin blade devoid of bulb and platform;

dorsal surface with a narrow patch of cortex; margins as also the two ends fully retouched from ventral surface.
4.4 × 1.9 × 0.6.

4. *Notched blades*

The notched working edge is always located on one of the margins. It extends to a part of the margin only and varies in length from 1.4 to 2.5 centimetres. The evideice from southern Africa proves for certain that these tools were meant to be used as spokeshaves for scraping, smoothing and paring down soft materials like wood and bone (Clark, 1958).

MBV-1 : 58 (Fig. 25, No. 7) — Thick blade with diffused bulb and plain platform; left margin with a prominent notch made from ventral surface.

7.9 × 3.2 × 1.6.

5. *Lateral edge-cum-notched blades*

The straight and notched edges are located on the margins and opposed to each other.

MBV-1 : 800 (Fig. 24, No. 8) — Thick blade with plain platform and prominent bulb showing fine ripple marks; left margin retouched from

ventral surface; opposite margin with a well-developed notch made from ventral surface.
7.9 × 2.7 × 1.6.

6. *Transverse edge-cum-notched blades*

The notched edge is always on the margins.

MBV-1 : 620 (Fig. 24, No. 9) — Thick blade with chipped off platform; distal end retouched, rather in a steep fashion, to a semi-circular shape from ventral surface; left margin with a prominent notch made from ventral surface.

6.8 × 1.9 × 1.4.

7. *Backed blades*

The blunting is confined to one of the margins. Two specimens are blunted to a somewhat crescentic shape and the rest in a straight line. The opposite margin is retouched in two examples, and in another case it bears a notch.

MBV-1 : 506 (Fig. 24, No. 10) — Blade with diffused bulb and plain platform; dorsal surface occupied by a single flake-scar; right margin blunted in a straight line from ventral surface; opposite magin with use-marks.

6.8 % 1.9 × 1.4.

SVG-1 : 15 (Fig. 24, No. 11) — Thin blade broken at the distal end; left margin blunted in a straight line from ventral surface.

2.9 × 1 × 0.6.

MBV-1 : 782 (Fig. 24, No. 12) — Blade with chipped off platform; right margin blunted, though incompletely, to a crescentic shape from ventral surface; opposite margin retouched all along.
4.8 × 2.4 × 1.2.

8. *Nosed edge tools*

This is a distinctive type and is represented by two examples. One is made on a nodule and the other on a thick blade. These tools differ from the borers in that their working ends, though nose-shaped, belong to the edge category and not to the pointed group.

SVG-1 : 119 (Fig. 24, No. 13) — Split nodule with flat surfaces; upper surface retaining cortex; working edge shaped by steep retouch executed from under surface.

4.5 × 3.2 × 1.7.

9. *Blade sections*

These are broken pieces of blades, and show retouch variously at the ends and on the margins.

10. *Burins*

There are in all 22 specimens in the collection. Three are made on flakes, 4 on exhausted fluted cores, 3 on nodules, one each on flake-blade and core flake and the remaining 10 examples on blades. All are of the single-ended variety. The techniques employed for obtaining the working ends or these tools are: (a) faceting involving the removal of comparatively large slices known as spalls of facets, (b) fluting involving the removal of thin and narrow slices called flutings or spallettes, and (c) chipping or retouch. The widely known classifications of burins are the ones made by BURKITT (1955, 63-8) and NOONE (1934, 82-92). None's classification is the comprehensive of the two, and is based on the technique of manufacture. The one followed here is based on the same criterion. However, type-names are given to the different categories of implements, so as to facilitate comparisons with the specimens found in other industries. We thus have 7 types of burins.

(a) *Single-blow burins*

The working edge is obtained by the removal of a single spall along one of the margins of the blank selected for working. 2 examples.

MBV-1 : 72 (Fig. 25, No. 14) — Blade with the dorsal surface bearing two low ribs; the working edge located at the distal end and obtained by the removal of a single vertical spall from the right margin.
4.3 × 1.1 × 0.6.

(b) *Bec-de-flute burins*

In these specimens, the working edge is formed by the intersection of single opposed facets. 3 examples.

SVG-1 : 45 (Fig. 25, No. 15) — Thin blade with chipped off platform; working edge formed at the distal end by the intersection of two oblique facets opposed to each other. Surface.
2.6 × 1.2 × 0.4.

(c) *Polyhedral burins*

Here one or both sides of the working edge bear two or more facets. One specimen has, in addition to the burin edge, also a working edge of the usual type. 4 examples.

SVG-1 : 8 (Fig. 25, No. 16) -- Flat nodule retaining cortex all over the body; working edge formed at the upper end by the intersection of two

oblique facets with two oblique facets. Surface.

3.5 × 2.4 × 1.3.

SVG-2 : 13 (Fig. 25, No. 17) — Flake-blade devoid of bulb and ptalform; dorsal surface with a patch of corex; left margin finely chipped from ventral surface and fashioned into a convex working edge; burin edge

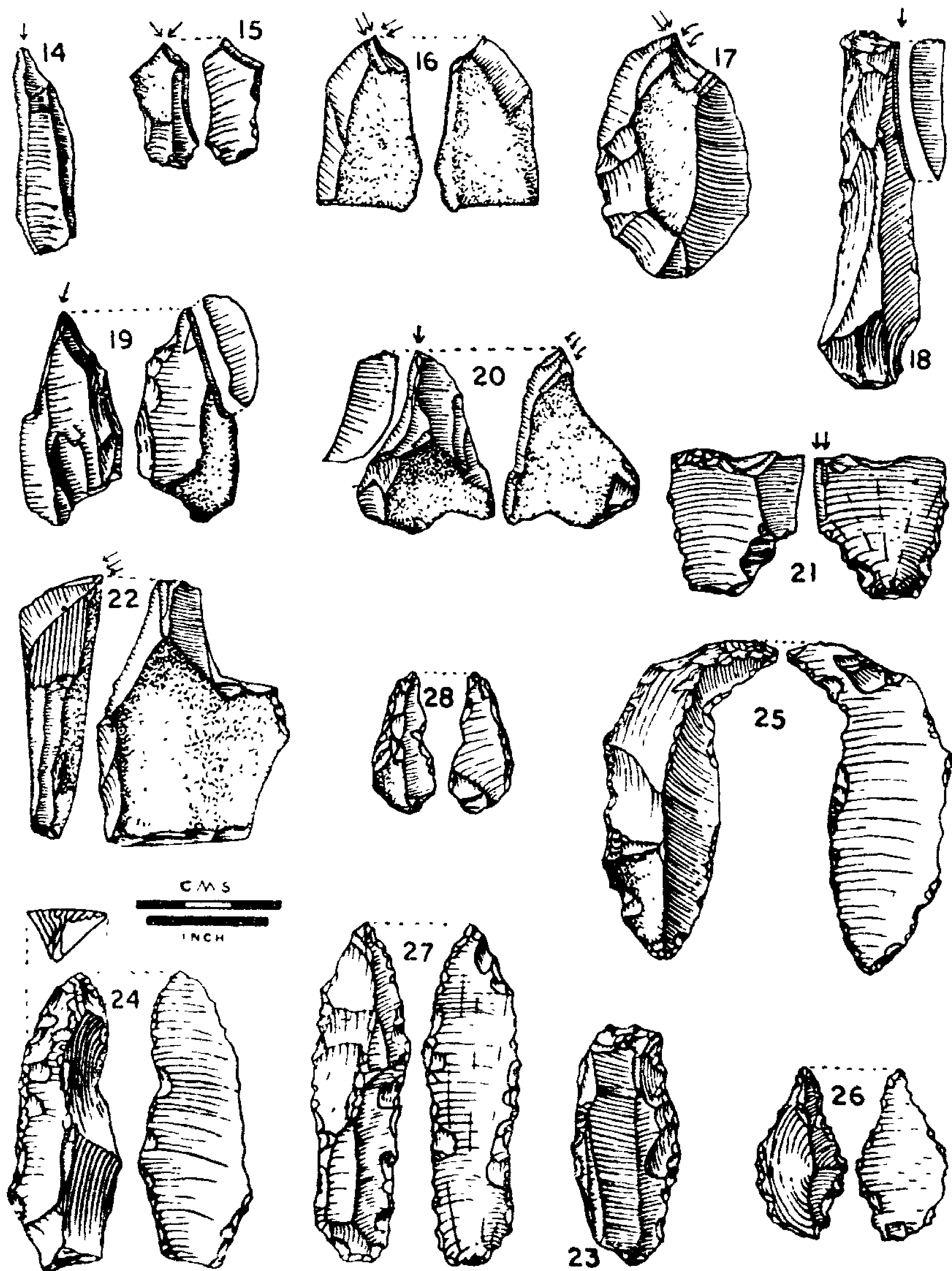


Fig. 25

formed at the upper end by the intersection of the two convex facets with two oblique facets.

(d) *Angle burins*

In these specimens, one side of the working edge bears one or more facets and the other simply trimmed by secondary chipping or retouch. 6 examples Three are of the 'transverse' variety, i.e. with the trimmed edge lying at right angles to the longer axis of the tool, and the remaining 3 of the 'oblique' variety, i.e. with the trimmed edge lying at an inclined angle.

MBV-1 : 115 (Fig. 25, No. 18) — Blade with plain platform and diffused bulb; dorsal surface with high mid-rib; distal end retouched in a steep fashion from ventral surface and intersecting the vertical facet on the right margin so as to form the working edge.

7.5 × 1.8 × 1.4.

MBV-1 : 963 (Fig. 25, No. 19) — Exhausted fluted core with flat surfaces; left side of the burin edge with a single oblique facet and the opposite side convex and retouched in a steep fashion.

4.4 × 2.1 × 1.4.

(e) *Busked, or beaked, burins*

As BURKITT (1955, 66) describes it, the working edge in these specimens "consists rather of a little nose than of a hollow gouge. It is formed by the intersection of a number of little facets with a single large graver facet, from which they curve away to the opposite edge of the blade or flake, thus determining the nose. Fluting technique is the rule for these little facets......" 2 examples.

SVG-1 : 73 (Fig. 25, No. 20) — Thin nodule with triangular outline; flat and cortexed under surface; upper surface partly worked; the large vertical facet on the left margin intersecting the three convex flutings made on the opposite margin and thereby producing the prow-shaped burin edge. Surface. 3.8 × 2.7 × 1.2.

(f) *Tiny burins*

These are miniature representatives of the angle burins, and are made on blade fragments. 2 examples.

MBV-1 : 789 (Fig. 25, No. 21) — Lower portion of a blade with faceted platform and tiny bulb; upper end retouched all along in a straight line from ventral surface; burin edge tiny, and formed by the intersection of the trimmed upper end and the two (one only ?) vertical facets on

the right margin; left margin retouched in a straight line from dorsal surface. 2.8 × 2.7 × 0.7.

(g) *Flat burins*

These differ from the specimens of all categories described above in that the working edge is now formed on the breadth, and not the thickness, of the blank selected for working. 3 examples.

SVG-1 : 34 (Fig. 25, No. 22) -- Flat nodule retaining cortex on both the surfaces; working edge located at one of the ends, robust and formed by the intersection of three obliquely facets on the upper surface with the flat under surface. Surface. 5.4 × 3.8 × 1.6.

II. NON-EDGE TOOLS

This group comprises 59 specimens in all. The following two types are present.

1. POINTS

These are divided into two major groups, viz. simple and tanged.

(a) *Simple*

The butt ends of these specimens are plain and devoid of any tang. Taking into account the nature and extent of secondary working employed in obtaining the pointed working end, they are further classified into four sub-groups.

(i) Specimens made on blades whose margins already converge to a point at the distal end; secondary working confined to the tip of the pointed end; margins with little or no working. 22 examples.

MBV-1 : 843 (Fig. 25, No. 24) — Blade with mid-ribbed dorsal surface; broken at the bulbar end; tip of the working end showing working on the dorsal surface; traces of working on the left margin also. 6.1 × 2.2 × 1.1.

MBV-1 : 290 (Fig. 25, No. 25) — Thin blade with tiny platform and prominent bulb; distal end beaked out and showing working on both the surfaces; margins also with traces of retouch. 6.7 × 2.5 × 0.9.

(ii) Specimens similar to those of sub-group (i) but with the margins also retouched all along. 8 examples.

MBV-1 : 565 (Fig. 25, No. 26) — Leaf-shaped blade devoid of bulb and platform; margins retouched all along and ending in a point at the distal end. 3.5 × 1.8 × 0.6.

MBV-1 : 286 (Fig. 25, No. 27) — Mid-ribbed blade with diffused bulb; margins straight and retouched all along, and ending in a fine point at the distal end. 6.9 × 2 × 1.1.

(iii) Specimens made on blades and showing blunting along one of the margins. 3 examples.

SVG-1 : 47 (Fig. 25, No. 28) — Small blade with diffused bulb and mid-ribbed dorsal surface; left margin steeply blunted to a convex shape from ventral surface. Surface. 2.9 × 1.3. × 0.7.

(iv) Specimens with the upper portion of one of the margins blunted in an oblique fashion. These are commonly known as obliquely blunted points. 4 examples.

MBV-1 : 40 (Fig. 26, No. 29) — Mid-ribbed blade with plain platform and diffused bulb; upper portion of the left margin and diffused bulb; upper portion of the left margin blunted from ventral surface to form an oblique point.

(b) *Tanged*

The specimens of this group have tanged butt ends. The tang is rather ill-developed in all the specimens. In 2 speciments it is obtained by shouldering the butt, while it is merely thinned down by secondary chipping in the remaining 4 examples.

SVB-1 : 162 (Fig. 26, No. 30) — Blade with the dorsal surface occupied by a single flake scar; working end located at the bulbar end; butt end with a double-shouldered tang. Depth — 1 to 11 inches. 5.9 × 3 × 0.8.

MBV-1 : 466 (Fig. 26, No. 31) — Blade with the margin converging to a point at the distal end; left margin as also the tip of the pointed end bearing secondary working on the dorsal surface; butt end thinned down by chiping off the high mid-rib of the dorsal surface 9 × 1.7 × 1.

SVG-2 : 11 (Fig. 26, No. 32) — Similar to the preceding one but smaller in size; butt end tocated at the bulbar end; margins as also the working end devoid of any working. 5 × 2 × 1.1.

2. *Borers*

The nose-shaped working ends of these tools are obtained by notching back the margins of the blank. Two are made on nodules and the rest on blades.

MBV-1 : 242 (Fig. 26, No. 33) — Blade with wide and plain platform and diffused bulb; distal end with a short but sharp nose notched on its right side from ventral surface; traces of use-marks on the margins. 6.4 × 2.7 × 1.5.

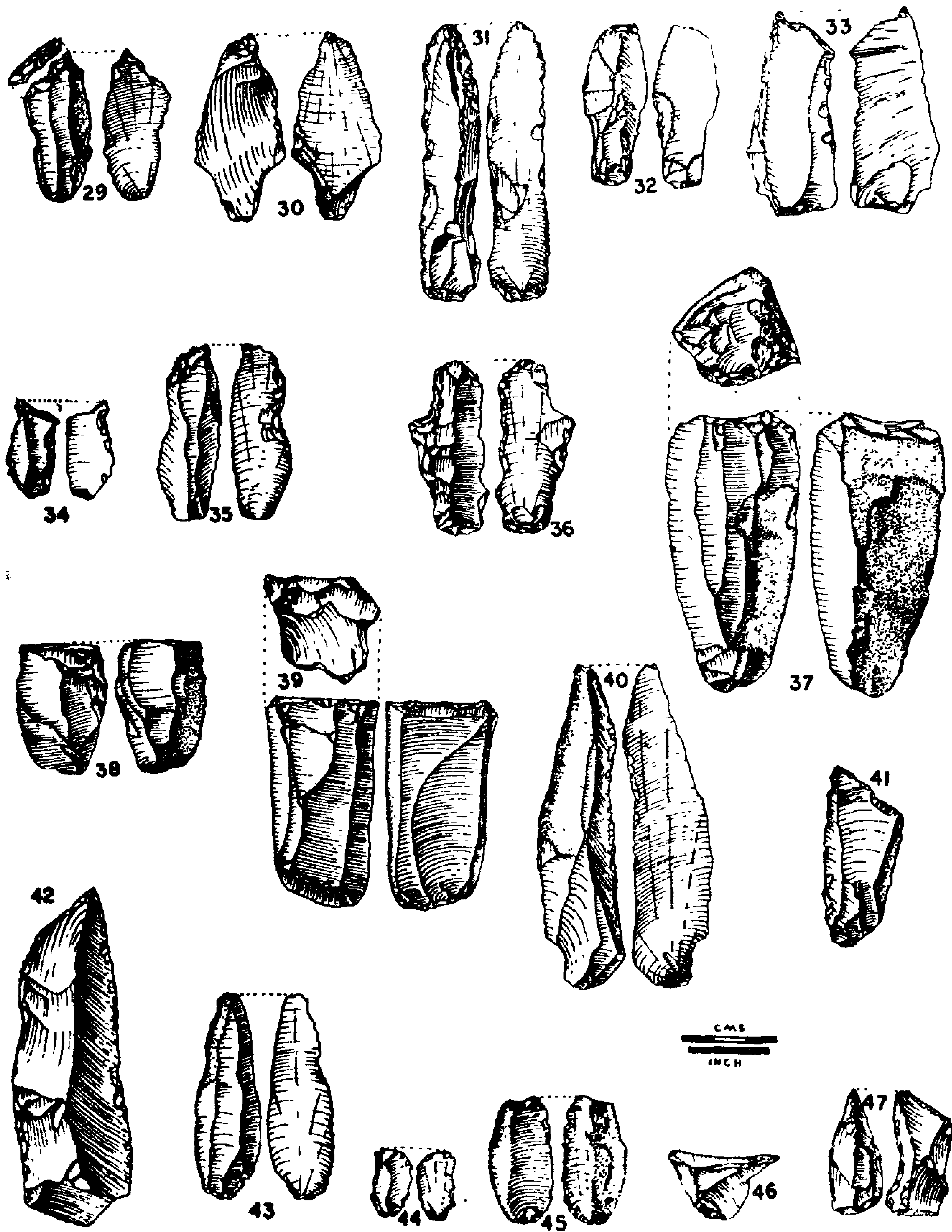


Fig. 26

MBV-1 : 240 (Fig. 26, No. 34) — Thin blade devoid of bulb and platform; upper end with a prominent nose bearing notches on either side made alternately from both surfaces. 3.1 × 1.4 × 0.6.

III. MULTIPLE TOOLS

This group comprises 8 speciments. Two types are represented.

1. *Notched blade-cum-point*

The notched edge lies on one of the margins.

MBV-1 : 34 (Fig. 26, No. 35) — Blade with two ribs on the dorsal surface; margins culminating in a point at the distal end, with the tip bearing slight retouch on the dorsal surface; left margin with a prominent notch made from dorsal surface. 5.5 × 1.8 × 0.9.

2. *Straight edge blade-cum-borer*

The borer end is located at the distal end in 2 examples.

MBV-1 : 719 (Fig. 26, No. 36) — Mid-ribbed blade with platform chipped off; right margin retouched in a straight line from dorsal surface; opposite one with a short and thick nose bearing a prominent notch on one side. 5.5 × .3 × 1.2.

B. SIMPLE ARTEFACTS

The type-wise distribution is as under :

Type	SVG-1	SVG-2	MBV-1	Total	
1. Fluted cores	15	3	19	37	(9.48%)
2. Blades (used)					
a) Single	15	1	39	55	(14.46%)
b) Double	4	–	35	39	(10.37%)
3. Blades (frush)	22	–	118	140	(37.23%)
4. Blade Sections					
a) Used	7	–	10	17	(4.62%)
b) Fresh (fresh)	20	–	22·	42	(11.17%)
5. Core Flakes					
a) Used	2	–	1	3	(0.82%)
b) Fresh	15	–	8	23	(6.09%)
6. Core Rejuvenation Flakes	9	–	3	12	(3.16%)
7. Flakes	–	2	–	2	(0 53%)
8. Rejects	–	6	–	6	(1.61%)
TOTAL	109	12	255	376	(100.00%)

1. *Fluted Cores*

Sixteen specimens are cylindrical or semi-cylindrical in shape and the rest have tabular bodies. Five specimens bear flutings all over the body. Flaking is carried out from one end in as many as 34 specimens, while the remaining 3 are worked from both the ends.

MBV-1 : 819 (Fig. 26, No. 37) — Elongated nodule with squarish transverse cross-section; platform exhibiting multiple faceting; one of the flat surfaces bearing three parallel flake-scars; the remaining part of the body retaining cortex. 8.8 × 3.5 × 3.3.

SVG-1 : 112 (Fig. 26, No. 38) — Core with semi-cylindrical body; plain platform formed by a single flake-scar; blades detached from both the ends; under surface retaining a narrow patch of cortex. Surface. 4.3 × 3.4 × 2.6.

MBV-1 : 567 (Fig. 3, No. 39) — Core with semi-cylindrical body; platform showing multiple faceting; body bearing flutings all over; under surface showing the negative scar of a blade detached from the lower end. 6.8 × 2.1 × 3.3.

2. *Blades* (*used*)

It is not possible to determine for certain whether the batter marks appearing on the margins are accidental or resultant upon use. Hence, these specimens are not considered under finished forms.

MBV-1 : 199 (Fig. 26, No. 40) — Blade with plain platform and diffused bulb; dorsal surface with a narrow patch of cortex; right margin with use-marks; opposite one fresh. 10.2 × 2.4 × 1.2.

SVG-1 : 185 (Fig. 26, No. 41) — Blade with tiny platform and diffused bulb; right margin blunt and cortexed; opposite one with use-marks. Depth — 1 to 11 inches. 5.7 × 2.3 × 0.8.

MBV-1 : 32 (Fig. 26, No. 42) — Thick blade evidencing cross-flaking; both the margins with use-marks and culminating in a point at the distal end. 10.7 × 3.5 × 2.

3. *Blades* (*fresh*)

The margins of these speciments are fresh and do not show traces of retouch or use.

MBV-1 : 135 (Fig. 26, No. 43) — Leaf-shaped blade with narrow platform and diffused bulb; dorsal surface with two low ribs; margins razor-sharp.

6.4 × 2.1 × 1.

SVG-1 : 243 (Fig. 26, No. 44) — Tiny blade narrow and finely faceted platform and prominent bulb; dorsal surface with a rib; fresh margins.

Depth — 11 to 18 inches. 2.1 × 1.1 × 0.3.

4. *Blade sections*

Seventeen specimens show use-marks variously on the margins and the broken ends.

5. *Core flakes*

They are usually thick and elongated, and are detached in the process of dressing the nodules selected for the production of blades. A large area of the dorsal surface is made up of cortex. Three specimens bear use-marks on one of the margins.

SVG-1 : 42 (Fig. 26, No. 45) — With plain platform and diffused bulb; right margin with use-marks; opposite one blunt and cortexed. Surface. 3.7 × 2 × 1.

6. *Core rejuvenation flakes*

These are by-products detached in the process of renewing the flueted cores which lost their shape in course of flaking. Four are detached along the longer axis and the rest from the ends.

SVG-1 : 187 (Fig. 26, No. 46) — Conical in shape and bearing remnants of parallel flake-scars; detached from the end. Depth 1 to 11 inches. 1.8 × 3.4 × 2.8.

SVG-1 : 110 (Fig. 26, No. 47) — Elongated flake removed along the longer axis; hollow ventral surfaces; dorsal surface evidencing cross-flaking on both the sides of the high mid-rib. Surface.

3.9 × 1.5 × 1.6.

7. *Flakes*

Both are of the prepared core type, and bear fresh margins.

8. *Rejects*

They include the by-products of primary and secondary flaking. Although not included here for want of a clear-cut criterion for division, it is certain that certain number of specimens in the collections from SVG-1 and MBV-1 belong to the present industry.

The typological analysis made in a rather elaborate manner in the preceding pages shows that the industry is characterised by the dominance of blades retouched along one or both margins. These tools account for about 25 per cent of the finished forms. Next in order come points making up for about 16 per cent. The notched edge blades (about 10 per cent) form another important category of tools. The burins account for about 8 per cent and as such could be considered as an inalienable component of the industry. The

common belief is that these tools were used for working bone by the groove/splinter technique. In fact this technique goes back to the dawn of the Upper Palaeolithic (MOVIUS, 1969, 118). Although no tangible remains are preserved to us, it is quite likely that the authors of our industry also worked upon bone and such other soft materials. The occurrence of backed blades (about 4 per cent) definitely suggests the coming into vogue of the tradition of making composite tools. The technological advancement as exemplified in this tradition prompts BRAIDWOOD (1960) to visualize the period covered by blade-tool cultures as an era of food-collecting (selective and intensified gathering).

IV. GENERAL OBSERVATIONS

Having described the stratigraphical position and the typo-technological characteristics, we may now proceed with a brief examination of the industry *vis-a-vis* its counterparts in India in particular and the blade-tool cultures in the Old World in general.

Firstly, the Rallakalava industry of the Chittoor district. This industry is undoubtedly the most characteristic of its kind in the Indian sub-continent. The artefacts are collected from four workshop sites and are found on the surface of a terrace consisting of Early Stone Age tool-bearing sediments. Quartzite forms the chief raw material. Almost the whole range of tools are made on blades. The typological ensemble includes simple and retouched blades, straight- and convex-backed blades, points, burins, scrapers, lunates, trapezes and triangles. The Rallakalava industry and the industry under study compare closely with each other, since both are based on the production of blade tools and again both belong to the late Upper Pleistocene/early part of the Sub-Recent period and occupy an intermediary position between the Middle Stone Age and Late Stone Age industries. Further there is also a correlation in the size of the artefacs. The greatest number of blades (22 per cent) in the Rallakalava industry measure in length between 4.1 and 4.5 centimetres, and the corresponding class of blades (24 per cent) of our industry fall in the class of 4 to 5 centimetres. However, certain differences are also revealed between the two industries in the technological and typological spheres. The Rallakalava indusry evidences better workmanship, as could be read from features like the perfect outlines and razor-sharp nature of blades and the constant employment of blunting type of secondary working. This industry displays highly evolved features in the realm of typology also. The blunted blades (knife blades and points) which occur but in a small number in our industry, account for about 45 per cent in the Rallakalava industry. Far more important is the occurrence (about 8 per cent) of true lunates, trapezes and triangles in the latter industry. Therefore, it seems likely that the Rallakalava industry belongs to a phase when the microlithisation of implements was beginning to set in. Its position is comparable with that of the Epi-Gravettian cul-

tures of Europe, such as the Magdalenina, the Creswellian, the Grimladian and the Hamburgian, which emerged during the terminal phase of the Upper Palaeolithic.

The industry from the Kurnool district, designated as Series III and assigned to the Sub-Recent period, lacks clear-cut stratigraphical evidence. The artefacts mostly occur on surface, sometimes in association with Series II (Middle Stone Age) tools in the middle coarse gravels and sometimes in the loose upper gravels. Chert and jasper are the two forms of raw material utilised. The tools are made on flakes, flake-blades and blades, and comprise scrapers, points, burins, backed tools, borers and axe- and pick-like forms. Although broadly belonging to the same chronological horizon and agreeing in fundamentals, the present industry differs from the Kurnool industry in two respects. In the first instance, our industry is devoid of tools on flakes and flake-blades. The other difference concerns the non-occurrence of scrapers and axe-and pick-like tools.

The Nagarjunakonda blade-burin assemblage comes from the central high grounds of a valley enclosed by hills. SOUNDARA RAJAN ascribes an Upper Palaeolithic status to it, and the artefacts are made of flinty chert and jaspery quartzite. The assemblage is found mixedwih flake-tool assemblages of the Middle Stone Age complex and as such is devoid of any stratigraphical evidence. Considered from technological and typological points of view, it does seem to possess an independent cultural status. Punch and pressure techniques are employed in the manufacture of artefacts. The types include simple and retouched blades, burins, scrapers, scraper-burins, points, borers, etc. The assemblage thus stands in broad agreement with those of our industry.

The Banjer industry of Central India, called Upper Palaeolithic, comes from the lower part of a gravel bed, with the upper part yielding microlithic artefacts of the Late Stone Age complex. Of the total number of 33 specimens, 19 are scrapers of various types made on flakes. The remaining 14 examples have been described as belongiig to the blade category. From the illustrations, they however appear to be only flake-blades. Therefore, the assemblage in all likelihood falls under the Middle Stone Age complex.

The blade industry from the Belan river in the Allahabad district of Uttar Pradesh possesses well-defined stratigraphical evidence. The artefacts occur in a gravel bed lying sandwiched between Middle Stone Age and Late Stone Age tool-bearing deposits. At present no details are available about the typo-technological characteristics of the assmeblages. It is merely said that the artefacts include fluted cores and blades of chert and other siliceous materials. Details are again lacking about the blade industry reported by Ghosh from the Singbhhum district in Bihar. It is also called Upper Palaeolithic and assigned to the late Upper Pleistocene. The artefacts occur in a layer of brownish clay overlying deposits yielding flake-tools of the Middle Stone Age complex. GHOSH

(*IAR*, 1965-66, 16) has also reported a similar industry from the Palamau district of the same state.

At the present moment it is not possible to study our blade-tool industry in relation to the Upper Palaeolithic cultures of Europe, Western Asia and Africa in an exhaustive manner, for the latter ones, unlike in the present case where the evidence is circumscribed to lithic assemblages, are associated with cultural remains of variegated nature. Further there is also a disparity in chronology: while our industry belongs to the terminal part of Upper Pleistocene/Sub-Recent period, the Upper Palaeolithic cultures all strictly fall with the Pleistocene. The present industry and the Upper Palaeolithic cultures, however, have in common two basic traits: (a) all are based on the production of tools on blades; (b) all occupy an intermediary position between the flake-tool and the microlithic industries. So far as tool-typology is concerned, the present industry cannot be compared with one particular Upper Palaeolithic culture. Speaking in general terms, the lateral- and transverse-edge blades, notched blades, blunted blades, burins, points and borers of our industry all find parallels in the early Upper Palaeolithic cultures of Western Europe. The nosed-edge tools and busked category of burins closely recall their counterparts in the Aurignacian culture, while the tiny burins remind one of the 'Noailles' burins of the Gravettian culture. Nevertheless, it is important to remember that several characteristic European forms like he keeled scrapers, double-ended burins, denticulate blades and pressure-flaked Solutrean points are absent in our industry. The closest typological parallels of the present industry, however, lie in the Amudian industry of the Levant and the Baradostian industry of Iraq. As with our industry, they show a dominance of simple and edge-retouched blades.

We may round off the study with a few remarks on the problem of origins of blade-tool cultures. Owing to the scarcity of human skeletal remains and the inadequate number of radiocarbon determinations, a good deal of uncertainty surrounds this problem. Basing on the stratigraphical position of the Amudian industry — it occurs in levels underlying the ones containing Levalloisio-Mousterian industries — it had been argued earlier by several writers that these cultures originated in Western Asia and hence radiated to other parts of the Old World. In a recent paper BORDES (1969) raises objections to this theory of diffusion, and, on the other hand, postulates that the transition from the Middle Palaeolithic to the Upper Palaeolithic took place independently in six centres viz. Western Europe, Central Europe, Southern Russia, Western Asia, Far East and Africa. So far as India is concerned, the problem is further complicated due to the limited nature of the distribution of blade-tool industries and also because of the fact that most of the industries are devoid of well-defined stratigraphical evidence. MURTY (1968, 98-101) tenders the hypothesis that the Indian industries evolved from the preceding flake industries of Middle Stone Age. The sporadic occurrences of blades has been taken to suggest that the blade tradition was immanent in the Middle Stone Age industries, in course

of time this parent tradition issued forth into true blade industries, partly due to the inventive urges of the artificer and partly as a response to the need for coping with new and improved methods of food procurement. While the possibility is a lively one, this theory of indigenous evolution will remain to be hypothetical till we obtain stratigraphical data attesting to a transitional phase between the flake-tool and the blade-tool industries. Further it is also well to remember that this particular problem forms part of the wider issue of the genesis of Stone Age cultures in their totality in the sub-continent. It is still an open question whether the various cultures as we know today are entities by themselves or form part of a single evolving tradition.

NOTES

1. The best summary accounts of these cultures are the ones given by Garrod (1938), Clark (1961, 50-62), Sonneville-Bordes (1963) and Bordes (1965, 147-209).
2. In the paper an inconsistency will be noticed regarding measurements. Owing to certain difficulties, it has become inevitable to furnish all the field-measurements in the English scale. The metric scale, which is currently in use in the country, is adopted for giving the measurements of artefacts.
3. These sites have been studied in detail elsewhere (Paddayya, 1968). In 1969 the writer discovered three more stratified Middle Stone Age sites named after the villages of Harnal, Maskanal and Bapperga. All of them are situated on the Don river.
4. It should be admitted that some degree of artificiality is involved in the two-fold division of assemblages from those two sites. The possibility cannot be ruled out that a certain proportion of flake and flake-blade artefacts belong with the blade-tool industry and a small percentage of blade artefacts with the Middle Stone Age industry. In fact, the rather low percentage of flake and flake-blade artefacts in the assemblage from Salvadgi-1, as observed in the collection from trial pit and also the ones made thereafter, makes the writer suspect that this site served as workshop for one industrial tradition only, i.e. the blade-tool industry.
5. The writer has made a detailed study of the Late Stone Age industry elsewhere (Paddayya, 1968, 90-117).
6. The measurements, given in centimetres, are of maximum length, maximum breadth and maximum thickness respectively.

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THE PLEISTOCENE GEOMORPHOLOGY OF THE UPPER KRISHNA BASIN

RAGHUNATH S. PAPPU

Introduction

THE PLEISTOCENE deposits in the upper Krishna basin are alluvial in origin and are mostly confined to present day river valleys. The field study of the alluvial bodies exposed in different reaches of the river Krishna and its major tributary Ghataprabha was undertaken by the writer. The information regarding the bore hole data of the Krishna at some of the engineering sites was also gathered. The presnt paper records the observations made by the writer, of the river system, and his attempt to reconstruct geomorphic history of the Krishna valley during Pleistocene times in the light of available evidence.

Present Environments

In the following paragraphs, a brief outline of the present environments viz., geographic setting, river system, geology, climate,soils and vegetation is given as it provides the basis for the reconstruction of the environment prevailing during Pleistocene.

Geographic Setting : The upper Krishna basin occupies the major portions of Satara, Sangli and Kolhapur districts of the Maharashtra State, and Belgaum and Bijapur districts of the Mysore Stae. It thus covers the area mainly drained by the river Krishna in its upper and middle reaches together with the area drained by its tributaries. (Fig. 27)

The two major hill ranges, the Sahyadris, also called the Western Ghats, and its transverse off-shoot called "Mahadeo Range", form the major hill complex of the region. The Sahyadris which form the western boundary of the basin run as a long chain of lofty hills roughly in a NW.—SE. direction and separate this part of the Peninsula into a coastal land 'Konkan' having a narrow width of 60-80 Kms. and Deccan uplands, 'Desh' on the eastern side. The Sahyadris have steep precipitous scarp face over 600 metres at many places on the Konkan side. The slope towards the east is, however, gentle and the landscape on this side has mature and mellow appearance in contrast to rugged appearance on the Konkan side. The Mahadeo range emanates as an off-shoot of the main Sahyadrian complex and stretches to east and south-east across the whole breadth of basin and sends of several minor ranges.

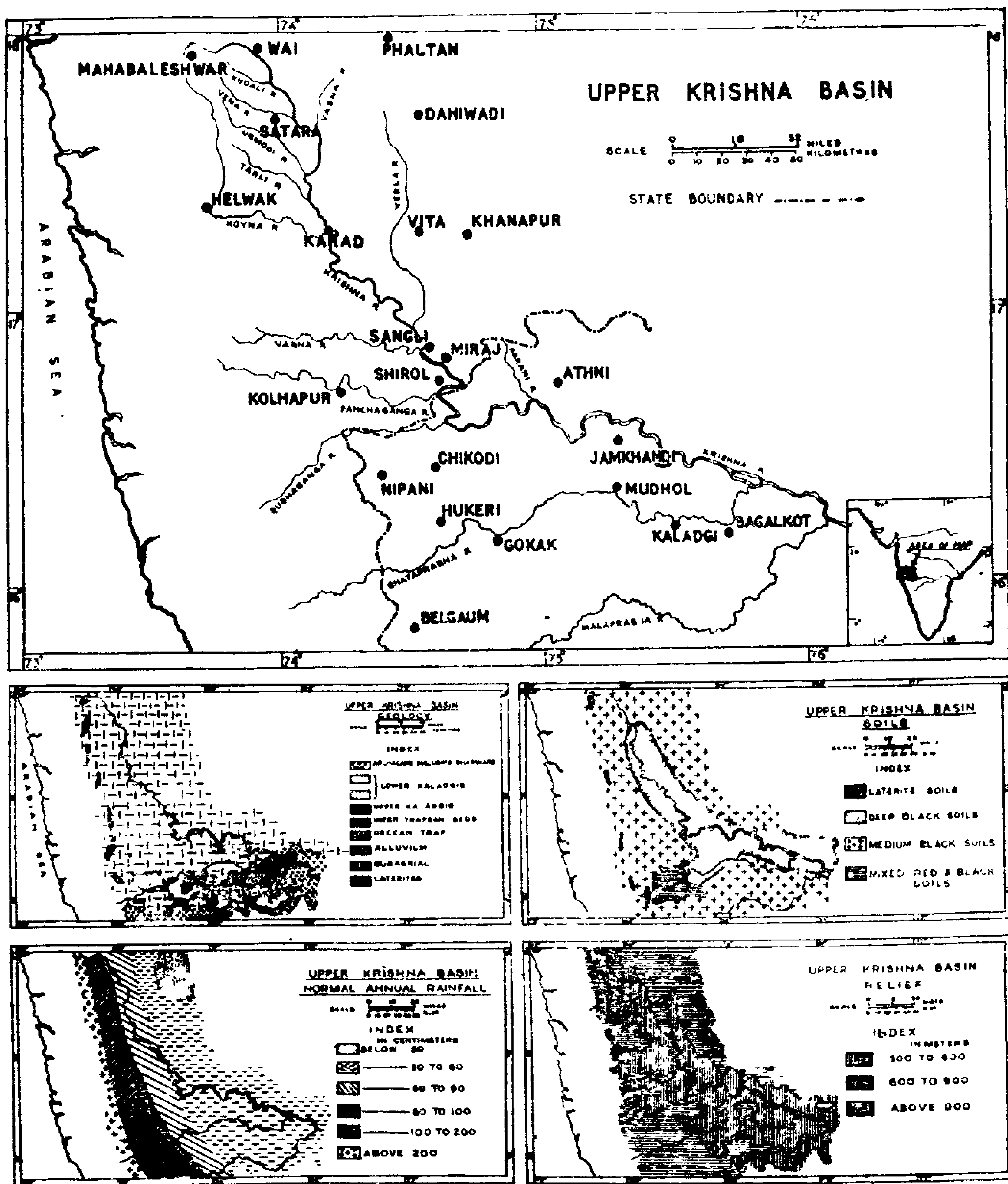


Fig. 27

River System : The Western Ghats are the main watershed of the Peninsular rivers in this region separating the short swift flowing west streams from the long winding courses of the eastward rivers. The transverse Mahadeo range forms the secondary watershed. Majority of the rivers in this region are characterised by their south-easternly drainage.

The source of the river Krishna is on the eastern brow of the Mahabaleshwar plateau, 7 Kms. west of village Jor in the extreme west of Wai town in Satara district at an altitude of 1500 metres above sea level. Its total length is about

1280 Kms. and total drainage is about 31,500 Sq. Kms. It flows across almost the entire breadth of the Peninsula from west to east in the states of Maharashtra, Mysore and Andhra and falls in the Bay of Bengal. The drainage map (Fig. 27) shows the sources and courses of the tributaries of the Krishna. The main drainage is thus from the Sahyadrian range.

Solid Geology : The Archaean is the oldest recognisable group of rock formations and is classified into two main groups, namely the Dharwars and the granite gneisses. The Dharwar system consisting of a complex series of metamorphic rocks like schists, phyllites etc., outcrops in small patches around Bilgi and Sitimani in Bijapur districts. The granite gneisses in this area are made up of several types of granites and gneisses and are found to outcrop in the southern portion of the basin in Bijapur district.

The rocks of the Kaladgi series come next in order and are confined to the southern part of the basin for a length of about 160 Kms. and in width varying from 64 to 80 Kms. The Kaladgis are made up of conglomerates, sandstones, limestones and quartzites and are almost horizontally bedded sedimentary rocks which directly overlie uncomformably over the folded and eroded Archaeans. They show their best development in the region lying in between the valleys of the Ghataprabha and the Malaprabha. The important Stone Age sites are concentrated in the Kaladgi region as the quartzites and the cherts of this series happen to be the favourite raw materials employed in preparing tools by Early Stone and Middle Stone Age men respectively.

The Deccan traps which cover almost major portions of the basin were erupted as horizontal lava sheets during the Cretaceous — Eocene times. Petrologically Deccan traps are surprisingly uniform in mineral composition and texture. The red amygdular soft basalt and ashy grey compact basalts are the two prevalent rock types commonly occurring in the area. Spheroidal weathering is prominently seen in ashy grey compact variety.

The laterites are found to cap the lava flows of plateau tops at Mahabaleshwar and Panchagani in the source region of Krishna. These rocks also outcrop in the semi-arid region of Bijapur district near Anagawadi on the river Ghataprabha.

Climate : The climate of the upper Krishna basin is typically monsoonal with the characteristic four months of monsoon climate followed by eight months of dry period of winter and summer. The cold weather starts by about the middle of November and continues till about the middle of February. In this season the mean daily maximum temperature in this part of the region is 30°C to 33°C while the mean daily minimum temperature is 14°C. The hot season sets in March and heat is become greater in April and May. The places like Bagalkot and Bilgi in the eastern part of the region record a daily

maximum of 37°C to 40°C. The rise in temperature is marked in the plains than that in the hills.

The upper Krishna basin can be divided physiographically into three tracts on the basis of the annual average rain-fall namely (Fig. 27).

(a) The Western heavy rainfall tract — over 125 Cms.

(b) The central moderate rainfall tract — between 125 to 62 Cms.

(c) The eastern semi-arid low rainfall tract — less than 62 Cms.

Soils : The soils in the major part of the basin belong to black cotton soil group and are of grassland pedocal (A/C) type (Fig. 27). Deep black soils are confined to low lands and mainly in the valleys of the main rivers like the Krishna, Ghataprabha and the Malaprabha. The depth of soil is often over 6 to 10 metres. Medium black soils are the prevalent variety occurring on uplands and slopes throughout the basin. These are light coloured and shallow. The red lateritic soils show their best development in the hilly heavy rainfall lateritic region. These are slightly acidic. The mixed black and red soils are found where both trap and laterite exposures occur side of side.

Vegetation : The types of the vegetation found in the region is mainly dependent on the rainfall and the degrees of moisture. The heavy rainfall areas (more than 200 cms.) are characterised by evergreen to semi-evergreen forests while in the areas with moderate rainfall (100 to 200 cms.) deciduous woodland savannah predominate. In the semi-arid eastern region (rainfall less than 60 cms.) dry deciduous and thorn scrub forests are well developed.

Pleistocene Stratigraphy

The river Krishna was surveyed from its source near Mahabaleshwar to downstream for a stretch of about 480 Kms. in its middle and upper reaches and the Ghataprabha, the major tributary was surveyed between Kovalli and Bagalkot for a distance of about 30 Kms. with a view to study the Pleistocene geology and associated Stone Age indusries. The stratigraphy was studied at 43 sites on the Krishna and 7 sites on the Ghataprabha. Out of 43 sites on the Krishna, 27 sites have yielded Stone Age tools, whereas all the 7 sites on the Ghataprabha are implementiferous. The 16 non-tool bearing sites on the Krishna are situated in the upstream Deccan trap region and have provided useful data regarding the Pleistocene sequence of the region.

In the following paragraphs, the stratigraphy observed at some of the selected sites is described.

1. *Kondawali Budruk* (73°48′ E, 17°57′ N) : This small village is situated 16 Kms. from the source and 12 Kms. west of the town of Wai in Satara dis-

trict. The huge cliff having thickness of about 12 mts. is exposed on the right bank. The basal rock is compact trap and is overlain by bouldery gravel (thickness 1 to 1½ mt.), and this in turn is overlain by dark non-kankary reddish brown silt (thickness 6 to 8 mts.). The fine pebbly gravel of 1 mt. thickness is found to rest on the reddish brown silt and this in turn is overlain by a layer of non-kankary red silt of 2 mts. thickness.

2. *Asagaon* (73°40′ E, 17°58′ N) : This place is situated at a distance of 20 Kms. from the source.

(a) The section exposed on the left bank opposite the Gandakeshwar temple consists of country trap at the base and is directly overlain by non-kankary reddish brown silt of 2 mts. thickness and this in turn is overlain by fine sandy gravel of 2 metres thickness which exhibits cross-bedding.

(b) The section exposed on the left bank 1/4 km. further downstream is made up of two sets of deposits each consisting of gravel and silt. The first set consists of coarse pebbly gravel (thickness ½ to 1 mt.) and non-kankary reddish brown silt (thickness 1½ mt.). This set is overlain by another set of fine gravel (1 mt. thick) and non-kankary reddish brown silt (7 mts. thick).

3. *Pachwad* (74°50′ E 17°52′ N) : This village is situated 43 Kms. from the source and 13 Kms. south-east of Wai.

(a) On the right bank, the coarse pebbly gravel of 1 mt. thickness is found at the base and has a lateral extent of 8 to 19 metres. This gravel is overlain by a reddish brown silt of 6 to 8 mts. thickness which contains few kankar nodules.

(b) The left bank shows red silt with a few kankars at the water level having thickness of 1 mt. and is overlain by fine gravel of 2 to 3 mts. thickness showing cross-bedding and this gravel in turn is overlain by kankary yellowish brown silt of 3 mts. thickness.

4. *Tembhu* (74°16′ E, 17°17′ N) : This village lies at a distance of 100 Kms. from the source and 5 Kms. east of the town of Karad in Satara district. Fine hard compact gravel having considerable lateral extent and thickness of about 1 metre and fairly rich in silica group minerals is exposed at the bottom directly resting on weathered trap. This gravel in turn is overlain by reddish brown silt of the thickness of 7 to 9 metres. A dark brown sub-recent silt of 5 mts. thickness is found to be abutting against these older deposits.

5. *Valve.* (74°25′ E, 17°21′ N) : This village is situated 180 Kms. from source and 13 Kms. east of Islampur. The stratigraphy observed on the right bank consists of country rock trap at the base which is overlain by hard cemented fine gravel of the thickness 1 to 2 mts., and this in turn is overlain by yellowish brown silt of the thickness 7 to 8 mts. The yellowish brown silt contains hard kankary layers.

6. *Padsalgi.* (75°25′ E, 16°35′ N) : This place is situated 312 Kms. from the source and 16 Kms. north-east of Jamakhandi town in Bijapur district. The the source and 13 Kms. east of Islampur. The stratigraphy observed on the right river bed is strewn with pebbles of both quartzites and basalts. The section exposed on the left bank consists of weathered trap at the bottom and is overlain by fine gravel of 1 to 1½ mts. thickness which in turn is overlain by kankary reddish brown silt of 4 mts. thickness.

7. *Anagawadi* (75°40′ E, 16°15′ N) : This village is situated on the river Ghataprabha and lies at a distance of 13 kms. north-west of Bagalkot town in Bijapur district. This site has provided a very good evidence of Early Stone Age industry and hence the excavation was conducted at this site in the pebbly gravel horizon. The section exposed in the nala joining the Ghataprabha river from right side is as follows :

The detrital laterite of the thickness of 1 to 1.5 mts. is exposed at the base. This laterite is ovrlain by pebbly well cemented gravel of thickness 0.45 to 0.60 mt. The matrix consists of sand and silt and cement is ferruginous. The pebbly gravel is overlain by sub-recent layers of brownish sandy silt of 1 to 1.5 mts. thickness and blackish clayey silt of 1.5 to 2 mts. thickness. The redeposited gravel having a thickness of 1.5 mt. is found to be resting against the earlier deposits.

The composite section as based on the above observations is shown in Fig. 28. The nature of the various sedimentary units exposed in different reaches of the rivers now will be discussed in detail on the basis of stratigraphy observed at some of the tites.

The gravel, sand, silt and clay are the main components of the exposed alluvium.

Gravels : The gravels encountered are divided into two types viz., the coarse and fine. The coarse gravels are further classified as bouldery, cobbly and pebbly, on the basis of size of the dominant component present in the gravel deposits (PETTIJOHN, 1957).

The bouldery and cobbly gravels are commonly found in the upstream hilly region. These are generally unsorted, polymodal, unimbricated and immature. They are characterised by locally derived angular boulders and cobbles suggesting their transport by colluvial agency. These are mainly transported by lateral movement by mass wasting processes.

The pebbly gravels are generally made up of well rounded water worn pebbles indicating thereby their transport mainly by alluvial agency. These are bimodal, unsorted and unimbricated. The gravel beds of both types, bouldery and pebbly, are always found at the base of cliff sections, and are found to rest on an uneven eroded surface of the country rock. The gravelly beds occur mainly as discontinuous fragmentary bodies. The average thickness of these

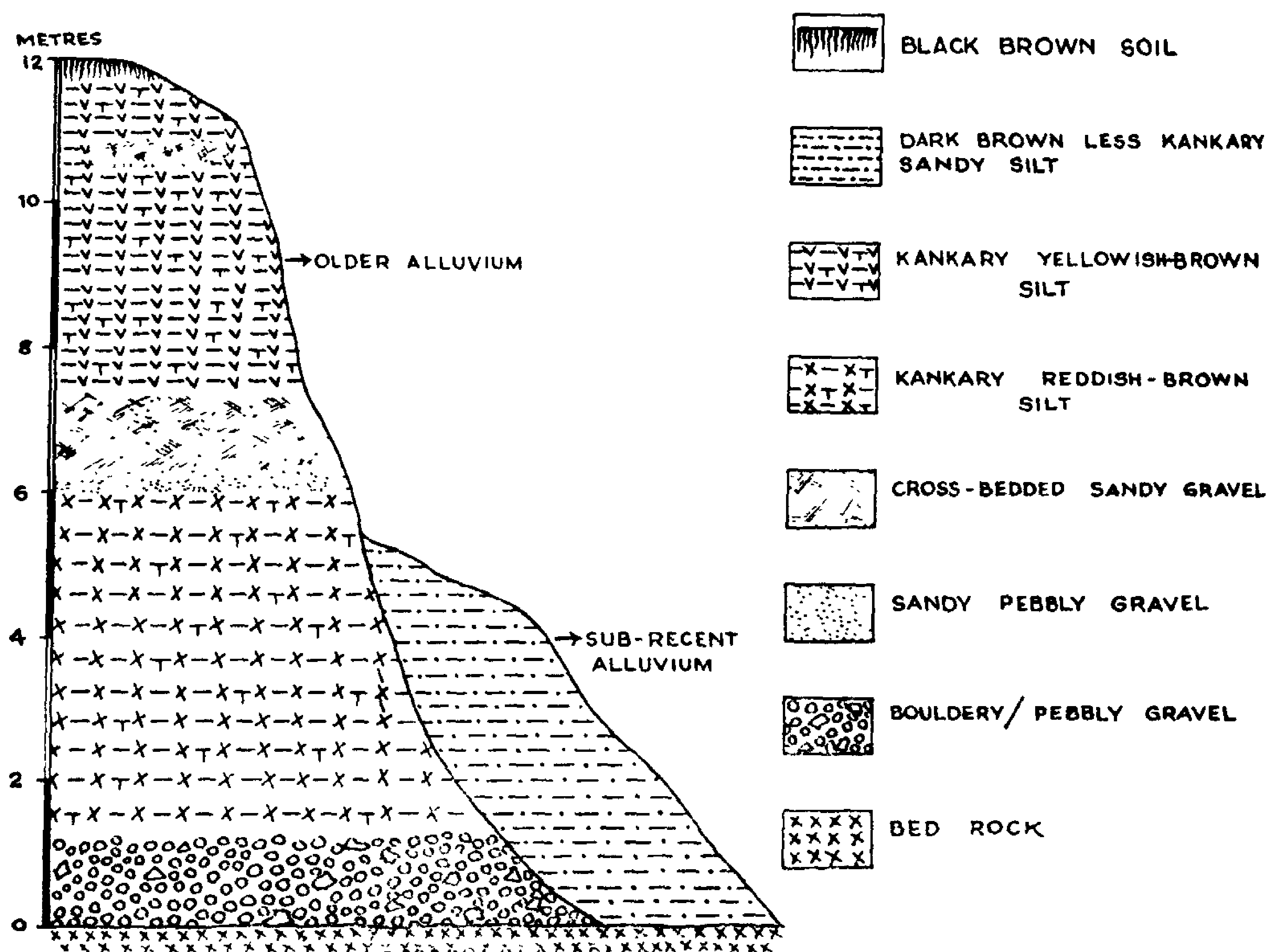


Fig. 28

gravels is about 1 to 2 mts. The matrix of the gravels is sand and silt and the cement is either calcareous or ferruginous. These basal gravel beds are the horizons of the Early Stone Age industry at many places.

The other type of gravelly beds commonly met with are pebbly to sandy gravels. These often exhibit cross bedding and are of widespread occurrence throughout the valley. These are unimodal and are found to be rich in silica family minerals. The average thickness of these gravels varies from 2 to 3 mts. They are found to occur in the following three situations, viz. :—

(a) Resting against the deposits of earlier phases;

(b) Resting directly on the eroded surface of the silt of the earlier cycle, and

(c) Resting directly on the country rock.

These gravels are the horizons of Middle Stone Age tools at a few places.

Finer alluvium : The finer alluvium includes sand, silt and clay. Of these, the silt is of widespread occurrence throughout the valley. The silts of the following shades of colours are recognised viz. :

a. Dark reddish brown silt.
b. Reddish brown silt.
c. Yellowish brown silt.
d. Dark brownish silt.

Dark reddish brown silts are found in the heavy rainfall upstream source region. These silts are slightly acidic (pH = 6.2) and are almost free from calcium carbonate. The second type of silts are of widespread occurrence and are noticed upto Sangli — a place situated 180 Kms. from the source. These are alkaline (pH = 7.2 to 7.5) and contain little calcium carbonate. The yellowish brown silt is common throughout the valley. These are alkaline and contain appreciable amount of calcium carbonate.

The sub-recent silts of dark brownish colour are exposed throughout the valley sizes of fine and coarse sands and clay bands are of common occurrence in the silty portion of the alluvium. These silts often overlie the coarse and fine gravels and attain a thickness of 5 to 10 metres in different part of the valley.

The sub-recent silts of blackish colour are exposed throughout the valley. These are alkaline but less calcareous than the older silts and often exhibit crude laminations.

Geomorphic Observations

In the following paragraphs some of the important geomorphic features observed during the study of river system are described.

The study of the longitudinal profile of the river Krishna drawn to the scale of 1 inch to 1 mile (Fig. 29) shows no major breaks and the profile appears almost to be a graded curve; however, field examinations of the river show presence of many knick points. This observation suggests rejuvenated nature of the river. At Wai and Arale in the upstream region, the river has not only cut through the alluvium but has entrenched the bedrock below (RAJAGURU, 1969). The river Ghataprabha shows the major break in its long profile in the form of waterfall (60 mt.) at Gokak in Belgaum district.

The valley of the river Krishna is relatively broad even in the source region. This can be accounted as due to processes of pedimentation or parallel retreat of slopes besides the major part played by lateral erosion by streams. The valley further downstream progressively becomes more wide and open and well developed meanders and broad flood plains having lateral extent of 3 to 4 Kms. are the common observable characteristic features.

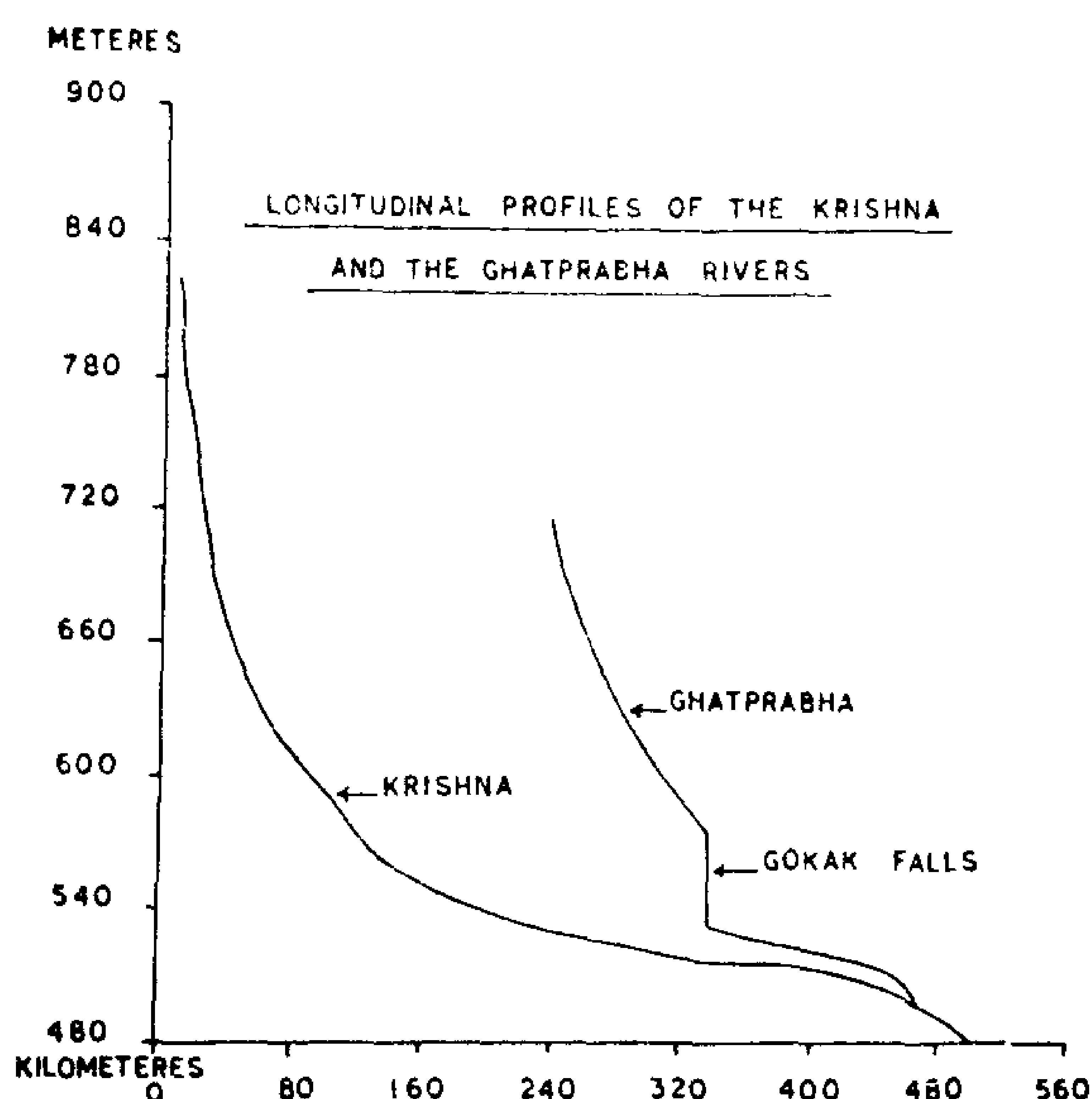


Fig. 29

The river Krishna in general follows the south eastern course and the river course has been found to be shifted at a few places. The changes in the course of the river, however, are not of major types as observed in the rivers of Indo-Gangetic plains.

At Pachwad and Anagawadi, the basal gravel beds exposed in the nearby nala situated at a distance of about 0.5 to 1 Km. from the present bed are similar to those exposed in the present channel of the river in all respects such as texture, mineral composition, cementing material, morphological characters of the components etc. This suggests that nala beds at these places represent the old bed of the rivers which in course of time have shifted their cources in a lateral distance of about 0.5 to 1 Km.

The course of the Koyana, one of the feeders of the Krishna, is very interesting. For the first 64 Kms., it follows in north-south direction parallel to the main Sahyadrian range contrary to the general flow of rivers in south-east direction. After this, it takes a sudden turn towards east, that is at right angles, and following this course it joins the Krishna at Karad. The north-south course of the river can be explained only by assuming that in all probability the river flows along some geological fracture possibly along a fault plane. It is also suggested that the anomalous course of the river may be due to the super-imposition from overlying mass of eroded basalts (RAJAGURU, 1969).

The general decrease in the sizes of the clastic elements is observed in the

down current direction. The sudden increase in the size of component is noticed at some of the places, and it is accounted due to:

(1) the presence of hard formation (Knick points) in the river bed.

(2) transportation of coarse material into the channel of matured river by youthful rivers and nalas.

The phenomenon of aggradation is found to be widespread throughout the valley right from source to downstream regions irrespective of variations in the local lithology and the topography.

The thickness of alluvium in general ranges from 12 to 15 mts in different parts of the valley. The lateral extent of the alluvium is about 1 Km. in the upstream source region while in the lower reaches the observed lateral extent ranges from 3 to 4 Kms. The observed thickness is not enormous as found in some of the rivers like Pravara, Narmada, Tapi and Mula lying to the north of the Krishna.

The bore hole data at the Dam site at Dhom and Borkhal on the river Krishna has shown that concealed alluvium below the present bed has a thickness of about 10 mts.[1]

Fossil soil horizons were found at Bavadhan nala near Wai (*IAR.*, 1967-68) and Dhamnair near Satara. At Bavadhan nala a redeposited red brown fossil-soil about 2 to 3 mts. thick was found to be sandwitched between coase sandy heavily kankarised silty alluvium whereas at Dhamnair, the brown fossil soil of 1 to 1.5 mts. thickness was found lying in between sandy gravel and brown silt.

Two terraces are generally found in the Krishna basin. The top surface of the older silts forms the older terrace and is generally observed at the height of 12 to 15 mts. above the normal water level. The river rarely reaches this height during present times excepting during exceptionally high floods. The younger inset type terrace built up of sub-recent alluvium and abutting against the older one occurs at lower levels about 5 to 6 mts. and thus the sub-recent to recent channels have become narrower than the Pleistocene ones.

The river Krishna, especially in its middle reaches, has an appearance of a misfit stream as it has a broad valley covered with thick alluvial deposits having lateral extent of 3 to 4 Kms.

Discussion

The observations described in the foregoing pararaphs show that Pleistocene record is very well preserved in the form of alluvial deposits throughout the valley. Let us now try to understand the factors mainly responsible for the nature and form of the present day river sysem.

Tectonic and Climatic Aspects : The easterly flowing rivers like Krishna in their upper and middle reaches have not been affected by Pleistocene sea level changes as this region lies far away from the sea.

The upper Krishna basin is believed to be tectonically stable since post-Miocene or at least post-Tertiary times; however, after the recent Koyna earthquake of December 1967 in the upper Krishna basin region, the earlier views need complete reconsideration.

The region lying north of the upper Krishna basin has been shown to be tectonically unstable during Pleistocene times.

Vrendenburg (1906) from the study of longitudinal profiles of the rivers Narmada, Tapti, Godavari and Purna, postulated that there was an extensive, though shallow, tectonic activity in the form of gentle anticlinical warping in these river valleys and these disturbances produced suitable rocky basins for the accumulation of fluviatile deposits.

RAJAGURU's studies (1968) in the South Central Maharashtra indicate that the aggradational and erosional phenomena of the rivers have been controlled more by large scale tectonic factors such as epeirogenic movements, both positive and negative, of the whole Peninsular block and/or by the climatic changes of the Pleistocene period.

The rivers lying to the north of Krishna basin like Narmada, Tapti, Mula, Pravara, Purna and Godavari thus are characterised by enormous amount of alluvium in their valleys and this phenomenon has been partly attributed due to tectonic changes of Pleistocene times.

In the upper Krishna basin the phenomenon of aggradation is widespread throughout the valley, however, such unusual thick accumulation of alluvium as in Godavari-Pravara valleys is nowhere found. The alluvium in general has a thickness of about 12 to 15 mts. throughout the valley. It, therefore, seems probable that in the Krishna basin the effects of tectonic movements were less pronounced than those in the Godavari-Pravara regions.

The present stage of our knowledge about the factors controlling the fluvial processes in monsoonal lands is not adequate and hence it is difficult to assess the exact nature of Palaeoclimatic changes.

JOSHI (1964) has shown that the gravels and silts can be deposited simultaneously in channel and flood plain parts of a stream during flood times. The gravel and coarse sand forms the bed load whereas silt and clay forms the suspension load of the stream.

The coarse basal bouldery and pebbly gravel beds both of colluvial and alluvial origin are unsorted and unimbricated and it can hence be inferred that these were deposited chaotically as point or channel bars by flash foods of

short duration. The pebbly sandy gravels exhibiting cross-bedding and cut and fill structures appear to be channel deposits formed by turbulent waters. The fine suspended material like silt was deposited as overbank or interchannel deposits by monsoonal floods (RAJAGURU and PAPPU, 1970).

As pointed out earlier, the present rivers have an appearance of misfit streams as they flow in a broad valleys with alluvial banks of 12 to 15 mt. thickness and the alluvium has a lateral extent of 3 to 4 Kms. especially in the middle reaches. The present stream is incapable of deposition or erosion on such a large scale. This suggests that rivers had higher discharges and more sediment load at the time of deposition of the older alluvium, thereby indicating that climatic conditions prevailing then were somewhat more humid than the present one.

The minerological studies of the older alluvium undertaken by RAJAGURU (1969) in the Mula-Mutha basin has shown that the predominance of products of decomposition in the alluvium indicates that the climate during the major phase of aggradation was somewhat more humid than the present one.

Dating : PILGRIM (1905) was the first to assign Pleistocene age to older alluvium of the Godavari on the basis of faunal evidence.

In Peninsular India, two main aggradational and erosional cycles were recognised and Early and Middle Stone Age industries belonging to 1st and 2nd aggradational phases respectively were dated to late Middle Pleistocene and Upper Pleistocene respectively (SANKALIA, 1963). Some of the typical fossils (*Bos namadicus*) were found in association with deposits of Middle Stone Age industry at Kalegaon on Godavari, and this species was thought to be late survival of Middle Pleistocene times.

The radio-carbon date for the Pleistocene deposits has been obtained from Mula dam site. (AGARWAL and KUSUMGAR, 1967). A semi carbonised log of *Terminalia* Sp. found in association with *Bos namadicus* (*Fadconer*) in the buried channel deposits of cut-off trench of the dam on the river Mula near Bargaon Nandur in Ahmednagar district was dated to about 33,000 yrs. B.P. These fossils were found about 500 mts. away from the right bank and about 10 mts. below the present bed of Mula.

Recently fresh water unio shells from Dhom on the Krishna river near Wai were dated to 39000 Yrs. B.P.[2] These shells were found in association with an elephant tusk about 200 mts. away from the left bank and about 20 mts. below the present top terrace.

On the basis of these two evidences, it can be said that tool-bearing Early and Middle Stone Age gravels exposed in the Mula and Krishna rivers belong to Upper Pleistocene period. However, this dating can be confirmed only after obtaining some more evidence.

Geomorphic History : From the field studies of various alluvial deposits, bore hole data and radiocarbon dates, the geomorphic history of the Krishna can be briefly reconstructed as follows :

1. *Erosional stage* : In the pre-depositional phase, the river was flowing in a comparatively wide valley and the base level of erosion was 10 mts. below the present bed level. This erosional stage cannot be earlier than Middle Pleistocene as the lowermost buried deposits have preserved only the Middle Pleistocene fauna.

2. *Aggradational stage* : On the basis of C-14 dates, the whole aggradational phase appears to be of Upper Pleistocene age as the dated sample comes from the basal portion of the old alluvium. The river became dominantly aggrading almost throughout the Upper Pleistocene, and the river was flowing about 5 mts. higher than the present one. The climate during this aggradational phase was somewhat more humid than the present one and the river had higher discharge and more sediment load. The changes in the stream channel were of more frequent occurrence as indicated by the cut and fill structures and sudden changes in the texture as represented by gravelly lenses of fluvial deposits.

3. *Erosional stage* s The river became dominantly eroding in the Holocene and the present base level of erosion was reached. The river at present shows clear signs of rejuvenation. During this erosional stage the older deposits got partially eroded and were replaced by sub-recent deposits mostly characterised by dark brown silts and sands.

In summary, the work by this writer has shown that

(1) Pleistocene record is very well preserved in the upper Krishna basin.

(2) Significant palaeoclimatic and geomorphic developments have taken place during the Pleistocene.

(3) The exposed as well as buried alluvium from the valley belongs to Upper Pleistocene.

NOTES :

1 This information was kindly supplied by Shri S. N. Rajaguru.

2 Personal communication received by Shri S. N. Rajaguru from Dr. D. P. Agrawal of Tata Institute of Fundamental Research, Bombay.

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SOME GEOMORPHIC AND TECTONIC OBSERVATIONS IN THE CENTRAL TAPTI BASIN IN DHULIA DISTRICT

S. A. SALI

I. *Introductory*

THE problem of Stone Age stratigraphy and climatic conditions in Maharashtra has been receiving attention of archaeologists for a number of years. It is generally held that the Deccan Trap region of Maharashtra has been tectonically stable since the beginning of the Mid-Pleistocene, that is the period to which the earliest material relics of he Stone Age Man of the region are assign-
which the earliest material relics of the Stone Age Man of the region are assigned, and that the present land-form is the result of differential erosion. These views gave rise to the general belief that no complex tectonic aspects are involved in the study of Stone Age stratigraphy of the region and that only the climatic factors contributed towards the aggradational and erosional processes of the rivers during the Stone Age.

The present writer has been exploring the region of the Central Tapti basin lying in the administrative unit of Dhulia district of Maharashtra State since 1957 from the archaeological point of view. In course of this investigation, besides discovering hundreds of archaeological sites culturally varying from those of the Mughal-Marathas to the Early Stone Age, he has also made some observations which would throw light on the geomorphic and tectonic aspects of the region. It is proposed to present in brief these observations in this paper.

2. *Geography, Physiography, Geology and Climate of the Region*

The district of Dhulia[1] lies roughly between Lat. 20°40′ to 22°00′ N. and Long. 73°35′ to 75°10′ E. in the north-west corner of Maharashtra State. It is bounded on the west by the disricts of Dangs, Surat, Broach and Baroda of Gujarat State and on the north by the region of Madhya Pradesh.

Physiographically the region falls into three major divisions : (i) the mountainous northern belt of the Satpuras, (ii) the Tapti plain proper and (iii) the southern hilly region.

(i) The northern broad belt of mountain land lies between the Narmada and the Tapti rifts. It consists of hill ranges running east-west which rise gradually from the first range on the Tapti side to the central one over 3000 ft. (over

900 m.) and slope towards the Narmada which flows along the north-western boundary of the district. This whole mountain land is cut up by numerous streams. The noteworthy tributaries of the Narmada are the rivers Devaganga and Udai and the Khat and Sambar nalas. Among the tributaries of the Tapti mention should be made of the rivers Aner, Arunavati and Gomai and the Vaki Nala, the Khadi Nala, the Mhais Nala and the Susari Nala. The rivers Aner, Arunavati and Gomai flow for a considerable distance towads west and then take southerly turn to meet the Tapti.

(ii) The Tapti plain proper, except the marginal narrow rocky strips and a few isolated outcrops of Trap within the boundaries of the Shahada and Nandurbar talukas, is filled with alluvium. Its height within the district varies from 350 ft. (106.680 m.) to 700 ft. (213.360 m.). The plain is about 23 km. broad at the Tapti's entrance into the administrative unit of the district but towards west it gradually narrows and at the river's entrance into Surat district of Gujarat State the Rajpipla hills on the north and the Sahydaris on the south close in.

(iii) The southern hilly region mainly consists of the dyke-region of Nandurbar taluka, the Nizampur plateau and the Navapur hilly region. A swarm of dykes is seen in Nandurbar taluka. They run east-west and north-east-south-west as well as north-south. These dyke hills have been cut through by several streams which run towards north to meet the Tapti and as a result they stand out in the region as lenticular masses. Some of these dykes intersect each other and the valleys thus formed at Kokni Pada and Umajacha Pada in the Ranka Nala basin were found occupied by the Stone Age Man. The Nizampur plateau with high escarpments on the west and north-west has a mild tilt towards east. On the east it gradually merges with the Tapti plain, All the rivers and nalas which meet the Tapti on its south, within the limits of this district, rise in the southern hilly region. Of these, the rivers Panjhra, Buray, Shivnad and Amaravati flow partly towards east and then take north-easterly and northerly course to meet the Tapti. In Sakri taluka the Panjhra valley is bordered on its south by the steep northern face of Galna hills.

Except for a small area in the north-west of the district in the Devaganga valley, which consists of sedimentary rocks of Bagh group, some containing marine fossils,[2] the entire area of the district is composed of the Cretaceous-Eocene Deccan Traps. Varieties of trap are found in the region. Those commonly found are a compact hard blackish variety with columnar jointing and the highly vesicular and much softer purplish and greenish traps containing secondary minerals like chalcedony, zeolite, calcite, agate, jasper and quartz. The other varieties so far found and got identified[3] are the porphyritic basalt and the fine-grained red basalt. Intertrappean beds of silicious tuff were noticed in the Ranka Nala basin while a specimen of chert with micro-fossils collected

in the bed of the river Panjhra at Dhulia suggests presence of an intertrappean bed of chert in the region. A specimen of shale with fossil-plant remains of "some Cretaceous pteridophytae" collected by this writer at Pechribari Pada also deserves mention. Intrusions of medium-grained dolerite have also been found. Ashy beds and those of red bole were noticed on the Nizampur plateau.

The columns in the dykes are pentagonal and occasionally trapezoidal and hexagonal. The dykes in the examined area vary in breadth from 30 cm. to over 3 m. Some of the dykes were traced for a long distance, the lengthiest example so far observed being the one which appears in the Deomarga forest west of Umaj and passing along the southern periphery of Nandurbar town runs towards east beyond Ranala, a distance of over 50 km. A number of dykes were also observed in the Satpuras and the southern hilly region.

More than 85% of the rainfall occurs in the region in the SW monsoon period, i.e., from June to September. Its distribution is, however, uneven, there being a marked decease from west to east. The hilly Navapur region receives more than 50 inches. The western parts of Sakri and Nandurbar and the entire Dhadgaon, Akkalkuwa and Taloda talukas receive between 50 and 30 inches. The remaining parts towards east receive between 30 inches and 25 inches or even less. The hot season records a maximum temperature of 46.1°C. (115°F.) but in the Tapti plain proper, especially in the area of sand-dunes north of Nandurbar, it rises upto 48°C. (about 118°F.). The cold period is in December and early part of January when the minimum temperature is around 11.9°C. (53.4°F.). The cold waves which pass over North India sometimes affect the region and in some parts of the district the minimum temperature at times drops even to freezing point of water.

3. *The Observations*

A. Superimposed Drainage

At present the river Tapti and its tributaries have cut their channels through the previously deposied alluvium. Their entrenched channeled indicate that the streams have been rejujvenated not long ago. Prior to this rejuvenation they were flowing along meadering courses as is evidenced by the occurrence of old meanders at Nizampur in the Buray basin, at Damarkheda in the Gomai valley and opposite Tonda in the Aner valley. The evidence, therefore, suggests that the present drainage of the region is of superimposed type. An excellent example of this type is at Tardi where downwarping was observed. Here the bed rock dips steeply towards north, that is towards Satpura. Yet the streams flowing past Tardi and east of it flow towards south and meet the river Aner. It appears that after the downwarping the streams from the Satpura and Tardi flowed towards the depression, filling it with alluvium. Subsequent rejuvenation of the streams caused them to cut into the alluvium-infilling thereby firmly establishing their course. Having thus established their course they further deepened their valleys into the underlying bed rock and

continued to flow through these entrenched channels as at present against the direction of the dip.

In many sectors of the valleys it was observed that deposits of older cycles lie away from the present channels of the streams, the area between these deposits and the present channels being filled with the deposits of younger cycles deposited during successive periods of aggradation, but separated from each other by a period or periods of erosion. Wherever observations were reasonably possible, e.g., at Dahival, Bhondgaon and Amli on the river Kan, the deposits of older cycles seem to rest upon the rock surface lying at a higher level than that upon which rest the deposits of younger cycles. In spite of this it appears that the sediments of younger cycles reached the height of that of the older cycles or even higher up so that the alluvium-filled valleys assumed the form of a plain instead of having a terrace-like appearance. Lateral shifting and rejuvenation, therefore, seem to have played an important role in the history of these streams.

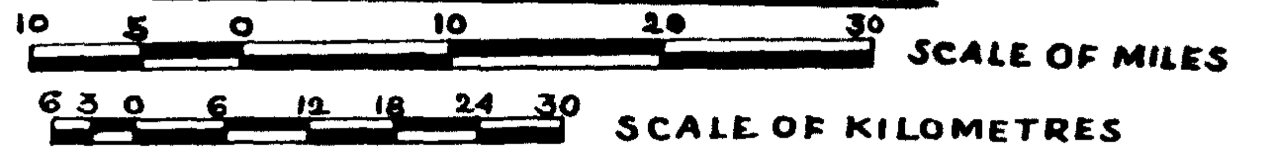
B. The Alluvium

The cliff-sections vary in height from a couple of metres to over 25 metres, the highest cliffs of sediments so far observed being on the Tapti. However, the height of the cliffs seen at present may not be taken to be a measure of the thickness of alluvium these sreams deposied so far. Because, examination of recently dug wells in the alluvium-filled valleys of the streams away from their present channels showed that much thicker accumulation of sediments than that observed in the exposed sections had aken place. Moreover in many sectors the streams flow over the alluvium and no bed rock was seen exposed at such places. These areas, therefore, appear to be the depression areas. The faulted area between Godi and Tardi in the Tapti plain has the thickest alluvium so far observed in this region. In the Aner valley near Tonda the deposit of current-bedded sandy fine gravel in a well was 30 metres thick and in the 42-metre-deep excavated well south of Ajnad (Bungalow) in the Tapti plain 18 metres of deep boring was made and yet no bed rock was encountered. The alluvium-spread across the valley varies from valley to valley.

The following table gives an idea about the so far observed lateral extent and thickness of the alluvium in the hitherto examined stretches of the rivers of the region.

River	*Known maximum thickness*	*Known Lateral extent..*
Panjhra	18 metres	1.5 km.
Kan	12 metres	2 km.
Buray	10 metres	1 km.
Shivnad	18 metres	1 km.
Arunavati	15 metres	2 km.
Aner	30 metres	2 km.
Tapti	60 metres	20 km.

SITES MENTIONED IN THE PAPER

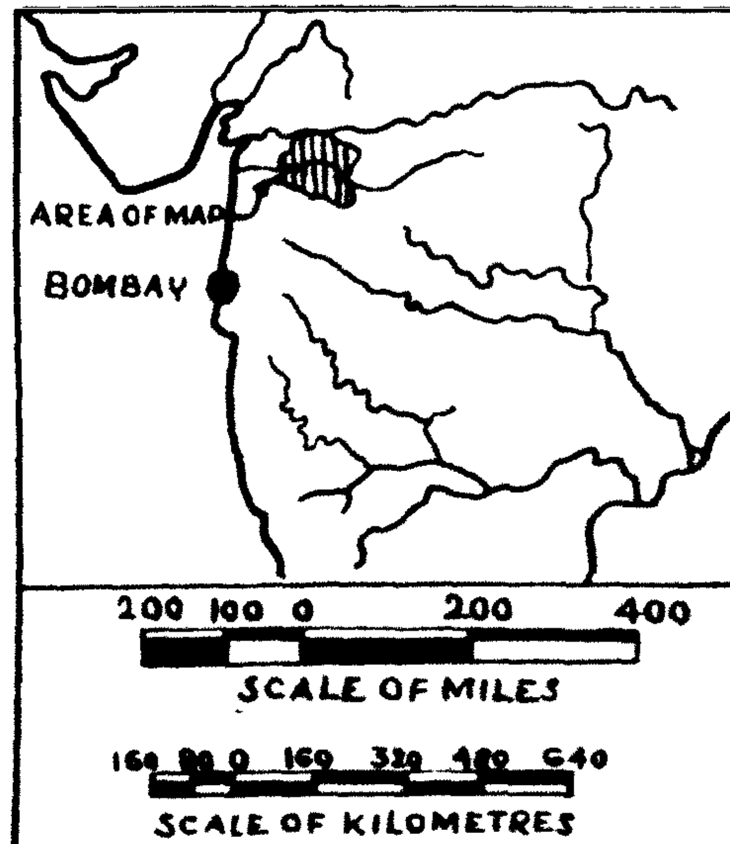


N

BARODA DIST.
NARMADA R.
UDAI R.
DEVAGANGA R.
BROACH DIST.
MADHYA PRADESH
GOMAI R.
TAPTI RIVER
SHIVNAD R.
ARUNAVATI R.
SURAT
6
5 RANALA
4
BALVAND
AMARAVATI R.
7
GODI
8
9
10
ANER R.
NESU R.
RANGAVALI R.
BRAHMANVEL
LONKHEDA
SONGIR
KAN R.
DAHIVEL
1
AMODA
3
2
SAIDNAGAR
DATARTI
PANJHRA R.
DHULIA
DIST.
DANGS DIST.
NASIK DIST.
JALGAON DIST.
BORI R.

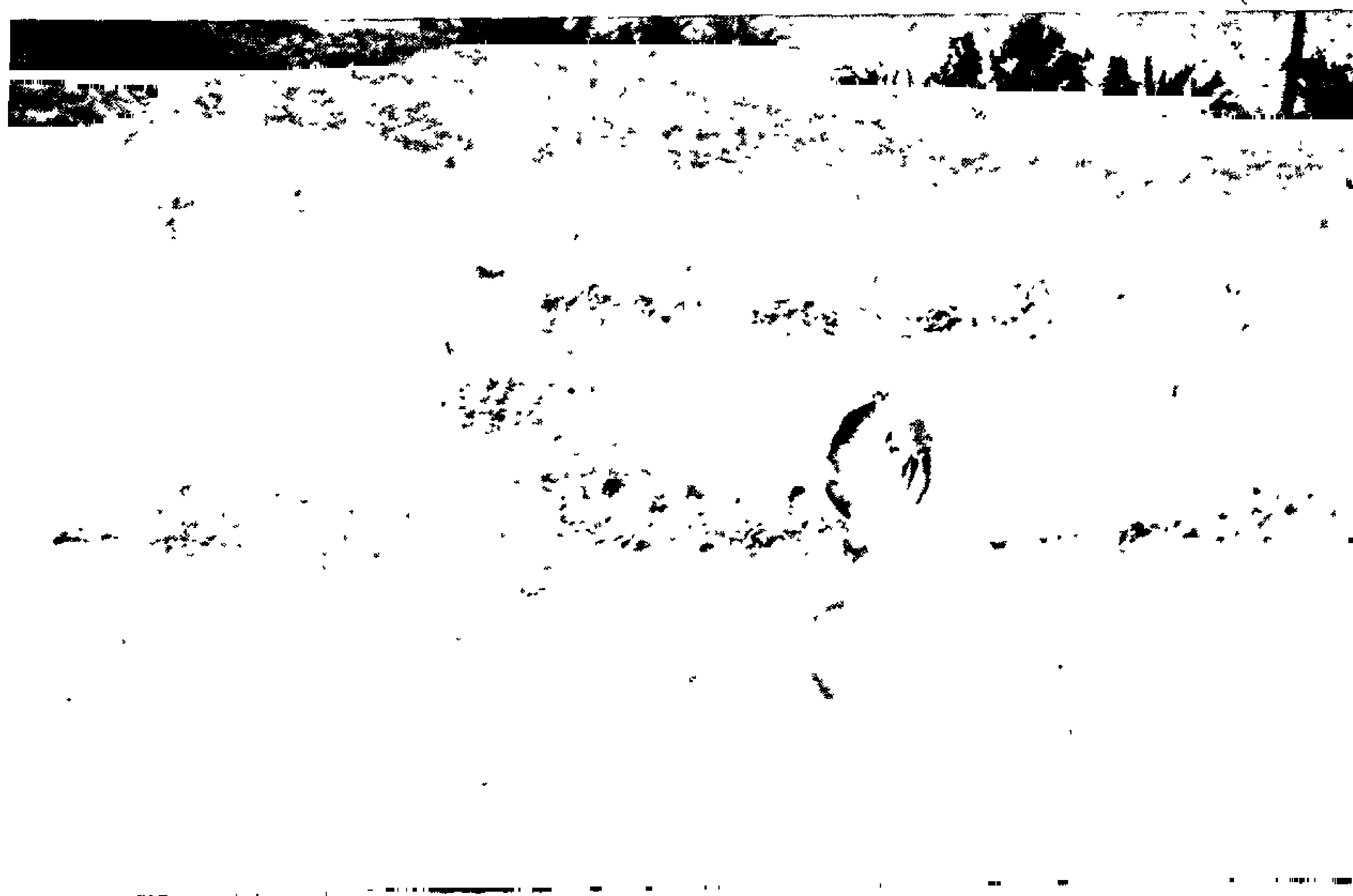
REFERENCE

1. BHONDGAON
2. BHADNE.
3. YESAR
4. ASHTA
5. JHARALI PADA
6. PECHRIBARI PAD
7. VANAVAL
8. AJNAD (BUNGALO
9. TARDI
10. TONDA.





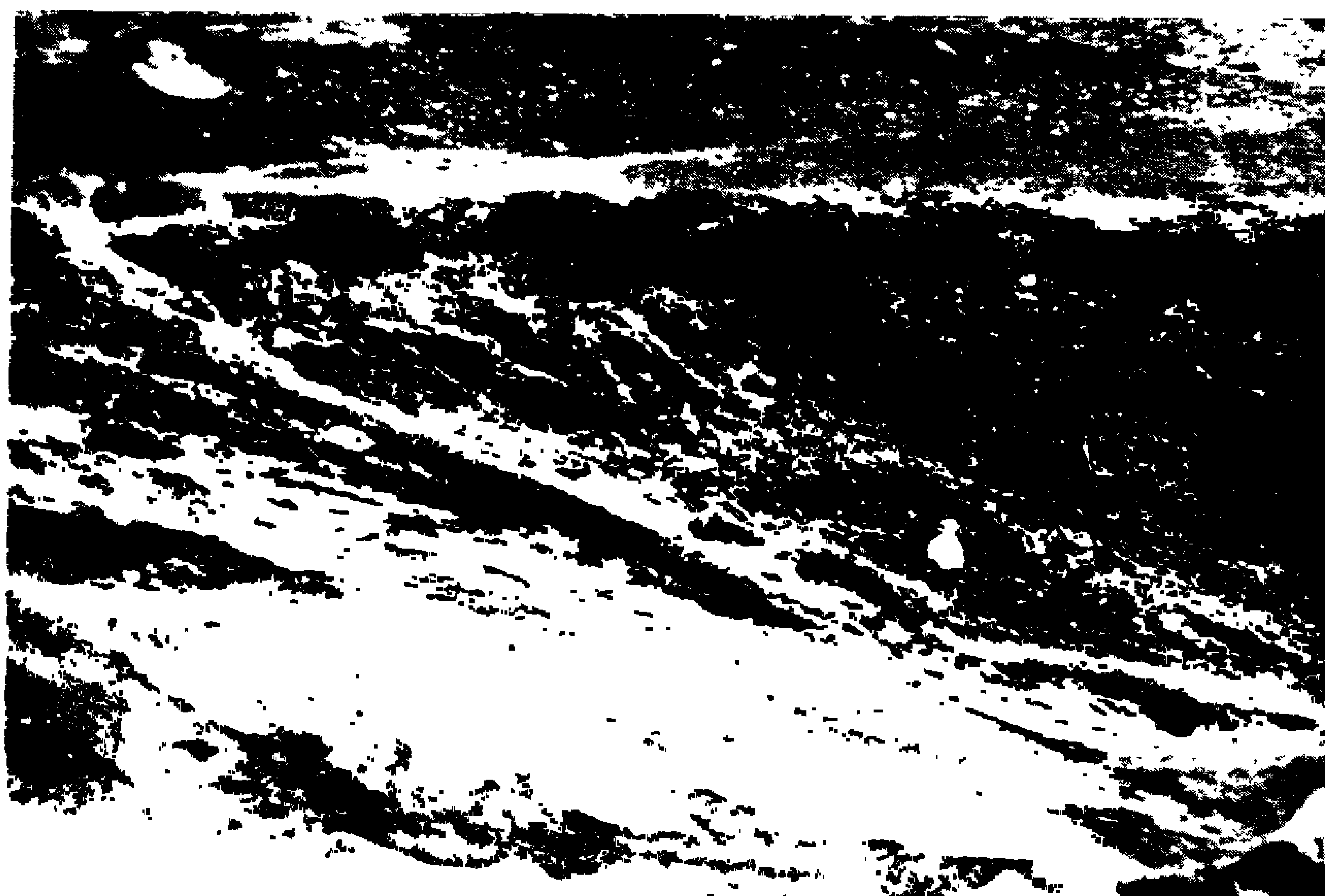
Pl. XIIIa : Cliff section at Salvadgi showing black brown silt



Pl. XIIIb : Cliff section at Hunsgi showing black brown silt with lenses of pebbly and granular gravel



Pl. XIVa : Tilted silt on the Tapti at Vanival



Pl. XIVb : Tilted bed rock and the overlying compact sand at Godi in the Tapti plain

It would be worthwhile to add some more information about the deposits in the Tapti plain. The present writer has not come across so far in the hitherto examined part of this river any deposit which may antedate that yielding the Middle Stone Age tools. This was observed to be so even in the downfaulted area south of a line roughly joining Godi and Tardi and east of it in the Aner valley. In the 42-metre-deep well south of Ajnad (Bungalow) the following deposits were observed :

(1) Highly calcereous brown clayey-silt at the water level
(2) Current-bedded sandy fine gravel
(3) Yellow kankary silt
(4) Current-bedded sandy fine gravel
(5) Yellowish grey kankary silt
(6) Dark brown or black soil.

The sequence of deposits in the cliffs along the right bank of the river Aner between the bridge and the village Dahila was the same as above except that here an evidence of heavy erosion was noticed after the deposition of deposit (2) above, of which only a small portion was seen survived at Tonda, elsewhere the yellow kankary silt uncomformably overlying the brown clay-silt. It should be mentioned here that similar evidence was also found on the river Arunavati in the Tapti plain.

Cliffs consisting of two gravels and their yellow silts were found to be quite common in the so far examined part of the Tapti. The gravelly bed of the Tapti is rich in yielding particularly the Middle Stone Age tools which are generally heavily rolled and glossy. The Middle Stone Age tools obtained from even the lower of these two gravels on this river are not fresh.

As has been pointed out, even at a depth of 60 metres below surface near Ajnad (Bungalow) in the Tapti plain no bed rock was encountered. This area lies on the 650-ft. contour. The present bed of the Tapti, south of this area, a little upstream from the confluence of the Aner with the Tapti, lies at 443 ft. above mean sea level where the bed rock is exposed. That means the depth of alluvium reached near Ajnad (Bungalow) was about 2 metres (7 ft.) short of the present level of the Tapti. However, in view of the downfaulting evidenced in this area it seems highly improbable that the bed rock can also be encountered here at the same level as that of the present bed of the Tapti mentioned above. It is not unlikely that alluvium may also be found below its present level. Although in the examined parts of the river Tapti no deposit which may antedate that yielding the Middle Stone Age tools has so far been found that does not mean that earlier deposts may not at all be present in the Tapti valley. They may be present anywhere in the area beyond the exposed alluvial cliffs at present bounding the channel of the river.

The characteristics of different deposits in the so far examined streams are more or less the same as that of those observed in the Kan basin.[4] It needs, however to be added that the earliest Early Stone Age tool-bearing deposit exposed in the bed of the Utavali Nala, a feeder of the river Kan, at Bhondgaon and that which underlies the red clay-silt which has been turned into calcereous tufa at Amoda on the river Kan differs in character from that of the contemporary found elsewhere in the same basin in that the former is sandy as against the latter which is gravelly.

The stratigraphic sequence of the alluvial deposits and the Stone Age industries in the explored part of the region does not differ from that obtained in the Kan basin. A word about the stratigraphic breaks or unconformities so far noticed needs, however, to be added.

Two uncomformities have already been noted.[5] Of these the so far known earliest was noticed after the deposition of the red clay-silt overlying the earliest Early Stone Age tool-bearing gravel. The other was found after the deposition of what was described as the chocolate fissured clay. The present writer has already shown elsewhere that this deposit in the Tapti and Godavari valleys, either partly or wholly, shows soil characteristics.[6] It was also surmised that "after the deposition of the clay the Tapti and the Godavari basins experienced degradation of their channels owing to hitherto unknown causes. The channels were raised again due to deposition of the sediments containing Middle Stone Age industries. During these degradational and aggradational processes, which seems to have occurred at the end of the Middle Pleistocene, weathering of the fissured clay took place, imparting it the soil characteristics."[7] Recently a distinct fossil soil bed, varying in thickness from 20 cm. to 40 cm., was found sandwitched between two gravels in the Buray valley at Brahmanvel. Stratigraphically it is definitely later than that described above and on the basis of comparative stratigraphy appears to lie between the gravels contemporaneous with those yielding the Late Middle Stone Age[8] industries and the Late Stone Age industries of the region. The evidence would thus show that the streams in this distinct witnessed three periods of erosion during the Stone Age.

Few fossils have been found but they await identification. On the basis of analogous evidence of Stone Age industries outside the Tapti basin, especially that obtained on the Narmada and the Godavari, the earliest two gravels — the Gravels I and II of the region — yielding Early Stone Age industries can be ascribed to the Mid-Pleistocene. The succeeding two gravels — the Gravels III and IV of the region — yielding respectively the Middle Stone Age and the Late Middle Stone Age industries may be assigned to the Upper Pleistocene and the next gravel — the Gravel V of the region — in which are found the Late Stone Age industries, to the end of the Upper Pleistocene or the beginning of the Holocene.

C. Evidence of Tectonic Movements

(i) *Concordant heights of knick-points in the river valleys and scarps in the Satpura* : It was observed that the knick-points, marked by rapids, waterfalls and gorges resulted from the recession of waterfalls, in the examined parts of the river and nala valleys lie at concordant heights.[9] It is interesting to note that from the study of one-inch maps it was found that the scarps in the Satpura hills in a region from the Burhanpur Gap westwards, on the Tapti side, lie at the heights which are very well in concordance with those of the knick-points. What relationship do they have with each other is not yet clear. It is also not yet clear whether all of them have resulted from tectonic movements or not. However, there is strong evidence to believe that *at least* the scrap at 1450 ft. above mean sea level along the south of the Satpura, overlooking the Tapti plain, in Shirpur taluka, has been caused due to the faulting that was observed between Godi and Tardi in the Tapti plain.

(ii) *Evidence on the river Shivnad* : The lacustrine conditions prevailing around Jharali Pada, near Ashta, on the river Shivnad during the period of deposition of the Late Middle Stone Age tool-bearing massive deposits of laminar sands came to an end perhaps as a result of earthmovements.[10] It should be mentioned that this area falls on the Lat. 21°10′N.

(iii) *Evidence at Pechribari Pada* : At Pechribari Pada, which is suituated 5 km. north of the above mentioned area and lies on the Lat. 21°22′ N., earth-movements appear to have disrupted the course of an earlier north-west—south-west flowing nala after the deposition of reddish brown sandy fine gravel, causing it flow north-eastwards as at present.[11] The lateral displacement of the ends of a dyke hill noticed here seems also to have been caused due to the same phenomenon.

(iv) *Evidence of hanging old bed rock of the river Amaravati* : From Ranjala to Balwand the river Amaravati flows almost throughout over the rock. A little downstream, from where the river crosses a dyke hill, extensive alluvium-spread is seen south of the present channel of the river and about 100 metres upstream from Balvand is a U-shaped fairly wide depression oriented north-east—south-west which in all probability appears to be an old bed of the river Amaravati. It opens at a height of about 2 metres above the present channel of the river on its right. The floor of his old bed consists of calcereous brownish clayey silt and the top of its sides is covered with sandy fine gravel. The hanging nature of the old bed here is noteworthy. The area is located on the Lat. 21°17′ N.

(v) *Evidence between Balwand and Ranala* : The hills lying on either side of the cart-tract leading from Balvand to Ranala, about 3 km. north of the former, show disturbance in their horizontality. This area lies on the Lat. 21°19′ N.

(vi) *Evidence at Vanaval on the Tapti* : On the river Tapti itself there is a clear evidence of faulting around Vanaval. Here, on the right bank of the Tapti the yellowish grey sandy silt with small lenses of fine gravel overlying the Late Stone Age tool-bearing current-bedded sandy fine gravel is tilted towards the east, an example of anomaly (Pl. XIVa). On the top of the tilted silt was found a chalcolithic burial site of the Jorwe Culture, the burials being partly in the black soil capping the silt and partly in the grey silt itself. It is definite that the earthmovements occurred here after the Late Stone Age. This area lies on the Lat. 21°20′ N., only about 20 km. west of Godi (see below).

(vii) *Evidence between Godi and Tardi in the Tapti Plain* : Another direct evidence of tectonic movements was obtained between the villages Godi and Tardi in the Tapti plain east of the area described above. At Godi on a small nala, locally known as Nāgaḍehā Nālā, on either side of Culvert No. 23 of the Shirpur-Chopda road near mile-stone 9/4, the bed rock and the immediately overlying cemented sand have a dip more than 10° SW (Pl. XIV,b). The highly cemented sand contains occasional coarse sub-rounded gravel. At places in its lowest levels the deposit tends to be gravelly, the gravel being of medium-to-fine grade. On the whole, however, the deposit is sandy and has turned grey in colour owing to the cementing material. Horizontally deposited two gravels and the intervening this deposit of yellow silt overlie the tilted sand near where the nala meanders. Exactly similar evidence was observed at Saver on the Khāryāḍoha Nālā about 30 metres downstream from Culvert No. 25 near mile-stone 10.

At Tardi, about 10 km. south-east of Godi, in the bed of a stream, locally known as Choryā Nālā, near Culvert No. 46, however, the bed rock shows a high-angled dip towards north, that is towards the Satpura, as against south-west that at Godi and Saver described above. This is perhaps an evidence of downwarping. Not unlike Godi and Saver here too immediately overlying the highly tilted bed rock is a deposit of highly cemented sand about 1.5 metres thick. This cemented sand contains occasional sub-rounded coarse gravel, the proportion of which is more than that in the cemented sand at Godi and Saver.

It is being found out whether the cemented sand was already present on the top of the bed rock at the time of downfaulting and downwarping at the above mentioned places or was deposited on the previously tilted bed rock.

It was in these downfaulted and downwarped areas in the Tapti plain that the unusual thickness of alluvium was noticed.

Overlooking the Tapti plain about 4 km. north of Godi and Tardi is a high escarpment all along the Satpura the top of which lies on the 1450-ft. contour. In all probability this scarp seems to have been originated due to faulting described above.

(viii) *Evidence at Lonkheda and Songir* : The easterly flowing Buray and Panjhra rivers take abruptly a north-easterly turn and then a northerly course, the cause of which appears to be a tectonic movement as suggested by the tilted low hills near Lonkheda and Songir. Both the places lie on the Lat. 21°5′ N., about 27 km. apart from each other, and appear to represent two points on a fault line.

(iv) *Evidence on the river Panjhara* : At Saidnagar, on the left bank of the river Panjhra, is a cliff-section about 18 metres high above the present rocky bed of the river. The right bank, on the Vasmar side, is rocky and at a much lower level than that of the top of the cliff on the left bank. The lower part of the cliff-section on the left bank was found concealed by the talus but in a cart-tract cutting, in the upper part of it, the following deposits were seen exposed :

(from top downwards)

(1) Reddish brown fine gravel
(—) Unconformity
(2) Highly calcareous yellow silt
(3) Light reddish brown fine gravel
(—) Unconformity
(4) Light brown silt with kankar
(5) Redeposited sand and fine gravel
(6) Calcareous brownish silt.

It is interesting to note that the lowest three deposits, (4), (5) and (6), show a mild tilt towards north.

At Datarti, on the same river on its right bank, about 6.5 km. upstream from Saidnagar, was also noticed a mildly tilted red gravel deposit. Against it was seen plastered a thick deposit of brownish silt. Extensive alluvial deposits were also seen south of the village.

4. *Conclusion*

From the above detailed observations in the Central Tapti basin in Dhulia district the following important feautres have come to light:

(i) The region has experienced tectonic movements in the past, the most extensive belt of such movements being that running east-west across the district roughly between Ashta on the west and Tardi on the east and lying roughly between Lat. 21°15′ and 21°22′ N. (Fig. 30).

(ii) There are evidence of shifting of channels and rejuvenation of streams more than once. The Stone Age stratigraphy is marked by at least three periods of erosion.

(iii) The unusual thickness of the river alluvium was noted in the areas in which evidence of tectonic movements was noticed.

The area under study being far removed from the sea it is unlikely that Pleistocene eustatism affected the behaviour of the rivers in this region. Rajaguru is of the view that the aggradational erosional phenomena of the rivers in south central Maharashtra have been controlled by more large scale tectonic factors such as epirogenic movements both positive and negative, of the whole Peninsular block and/or by the climatic changes of the Pleistocene period.[12] However from the nature of alluvium so far observed by the presnt writer in the Central Tapti basin in Dhulia district it seems doubtful if appreciable climatic changes had taken place in this region since the Mid-Pleistocene. The gravels deposited by the rivers do not show marked variations in their grades in relation to different periods. The occasional coarse material found at places, especially in the Early Stone Age tool-bearing gravels, may be attributed to the local conditions. Moveover, the gravels deposited by the rivers during the entire Stone Age period seem to be of the nature of those being deposited by them under the present climatic conditions.

There is clear evidence of earth movements that had taken place in this region in the past, although it is yet to be established when actually they took place. Yet from the aforesaid features that have come to light so far it seems quite probable that tectonic movements have played an important role in the geomorphological developments in this region and that the aggradational and erosional processes of the alluvium sediments of the Stone Age appear to be intimately linked up with them. Further detailed study, which is being undertaken, may thrown more light on these aspects.

REFERENCES

1. In 1906 the district of Khandesh was divided into two districts, called West Khandesh and East Khandesh with headquarters respectively at Dhulia and Jalgaon. The West Khandesh district was renamed as Dhulia district in 1960. The area considered in this paper is that which comprised the former West Khandesh district.

2. *Memoirs of the Geological Survey of India.* Vol. VI, pp. 211 and 346-351.

3. I am highly obliged to the superintending Geologist, Geological Syrvey of India, Western Circle, Bombay, for identifying the specimens sent to him.

4. Sali, S. A., "Quaternary Stratigraphy in the Kan Basin at Bhadne and Yesar—Results of Recent Preliminary Exploration", *Journal of the Asiatic Society of Bombay,* Vols. 39-40, (1967), pp. 157-167.

5. Sali, *op. cit.,* pp. 162-163.

6. Sali, S. A., " On the Occurrence of Fissured Clays in the Tapti and Godavari Valleys", *Proceedings of the 54th Session of the Indian Science Congress, Abstracts,* p. 500.

7. *Ibid.*

8. This term has been used here to an industry of the region which stratigraphically succeeeds the Middle Stone Age industry but precedes that of the Late Stone Age. This industry is characterised by parallel-sided blades and corrtsponding cores, burins, various types of scrapers, arrowheads of the transeverse and tanged varieties, awls and points. The tools of this industry are comparatively smalltr than that of the Middle Stone Age but larger than that of the Late Stone Age.

9. *Indian Archaeology* 1967-68—*A Review*, pp. 32-33.

10. *Ibid.*

11. *Ibid.*

12. Rajaguru, S. N., " Some Aspects of the Pleistocene Period in South Central Maharashtra ", *La Prehisoire*, 1968, p. 354.

A NEW TYPE OF PASSAGE CHAMBER TOMB IN KALADGI, DISTRICT BIJAPUR, MYSORE STATE.

A. SUNDARA

KALADGI (Lat. 16'.10' N Long 75'.30'. E.) situated on the left bank of the river Ghataprabha, formerly a District head-quarters of the same name in 19th century, is now an ordinary town in Taluka Bagalkot, District Bijapur, about 35 km. west of Bagalkot. There is regular bus service of the Mysore State Road Transport Corporation from Bagalkot, (a railway station on the Hubli-Sholapur line of the South-Central Railway,) via this place to Jamakhindi, Mudhol (both Taluka head-quarters in Bijapur District.), etc..

This is the place where for the first time the basin of a series of sedimentary rocks comprising sandstones, quartzitic sandstone, quartzites, conglomerates, etc. was recognised and is therefore named after the place, i.e. the Kaladgi Series. Excepting a hill about 2 km. North-East of the locality, there are no prominent hills as such in the nearby area. Small eminences of rocks are found on the eastern side. But for these, the locality is a plain land of sandy reddish brown soil, sometimes grey, with patches of black cotton soil. The hill on the north-east side, about 35 m. high, in the north west-south east direction, is highly quartzitic on the surface with a ridge of boulders on the top; laterite covering on the sides and conglomerates mostely in the bed of the river flowing beside the western edge. About 2 km. east of this hill, are some hillocks with laterite capping the upper part of which is highly disintegrated into roughly rectangular boulders of different sizes, already detached from the mother core. The river, Ghataprabha, flowing south-east wards from a distance, suddenly takes a steep curve on the north side of the locality and begains to run north-east wards past the hill.

The hill is locally called "Saifuddin Guḍa" named after a Muslim saint whose tomb is in a modern pillared pavilion with a stone wall enclosure site just by the side of the Saidfuddin Dargha on the hill.

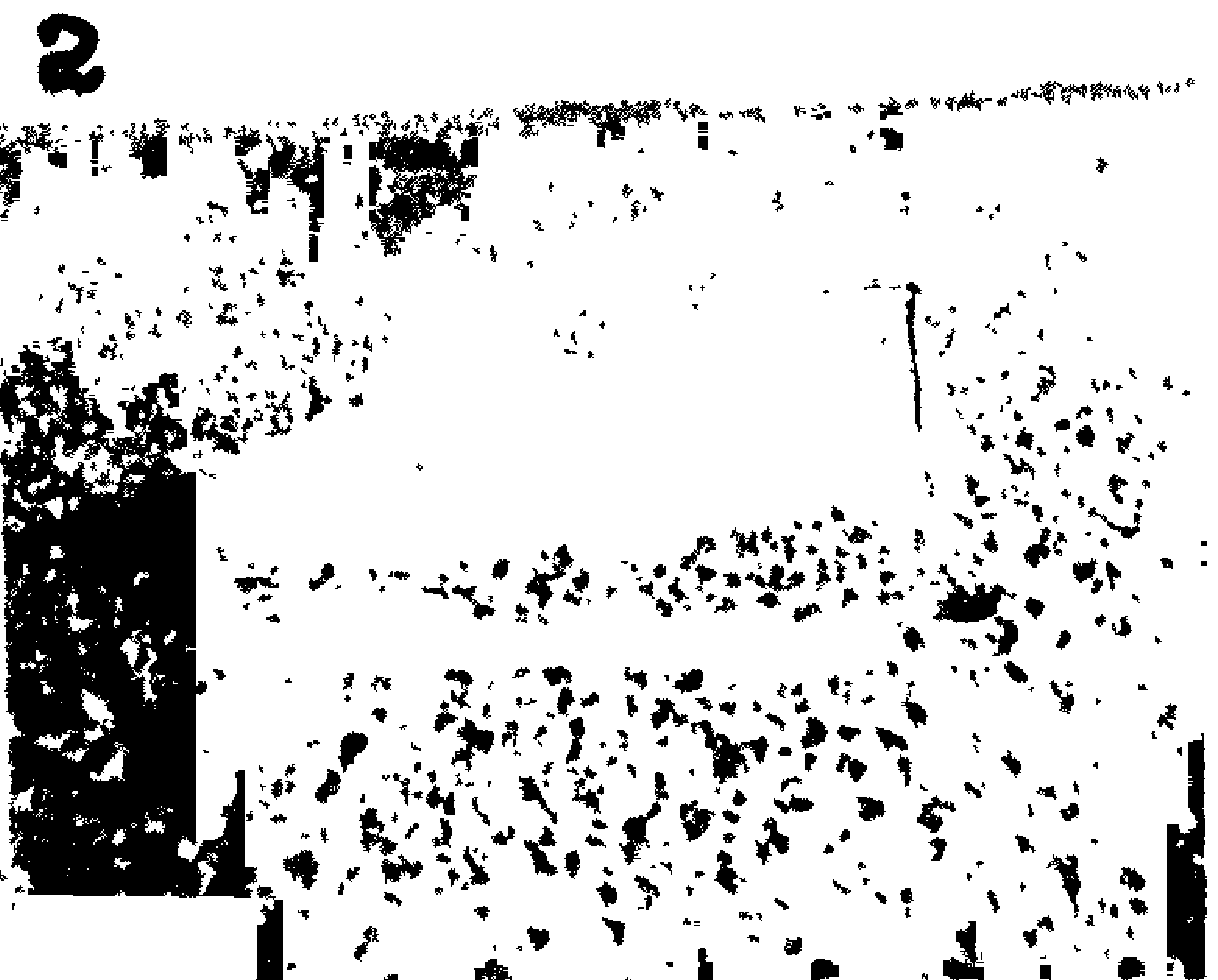
In the geology section of *Bijapur District Gazetteer*, a hill of this locality is, strangely enough, called "Cromlech hill". Excepting this name, no reference to megalithic tombs or site, is given. I thought the name given by the geologist was perhaps due to the presence of some megaliths which would become the distinctive feature of the hill for easy identification. But, on

1





2





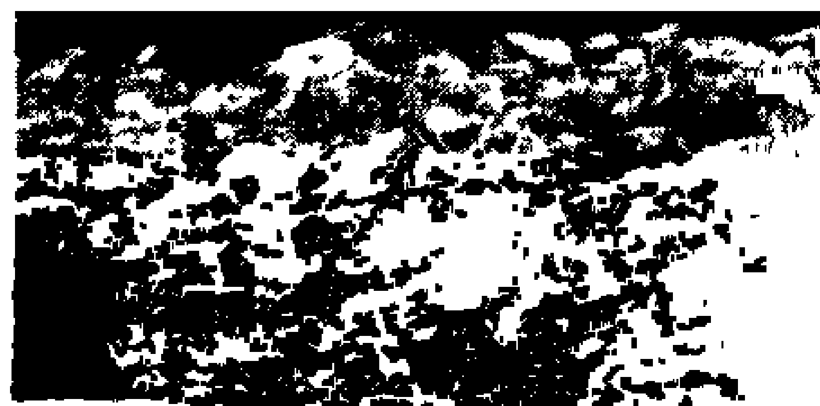












Pl. XVI : Kaladgi Megaliths

enquiry I am given understand that no hill here is now called Cromlech hill. Nevertheless, in connection with my research on megaliths in North Karnatak, I took the old reference as clue, explored the locality, and noticed a megalithic site just by the side of the Saidfuddin Daragha on the hill.

The site commands a panoramic view of the river, the surrounding plain fields under cultivation and the town. On the southern fringe of the hill, are thickly scattered iron slags.

On the site are found about 43 megaliths of mostly the passage chamber tomb of the type not known hitherto from any of the reported sites[2] in the Deccan and South India. What follows is, therefore, mainly a descriptive account of these megalithic tomb types.

The passage chambers, locally known as "Jalāl-Bāvāgaḷa Duṇi" (Fire-hearths of Muslim recluses), are scattered in an area of about eight to ten acres. Like other sites, this site also is disturbed. However, the structural part of most of them, is less disturbed and on the whole gives a complete idea of this type of tomb architecture.

Types of Megaliths

Mainly there is only one type : that of passage chamber. Besides, there are five stone circles without apparently chambers in the interior.

1. THE PASSAGE CHAMBER

In general the chamber, roughly hexagonal on plan, is formed by five orthostats with a short passage much lower in height than that of the chamber, and surrounded by a circle. The passage opens into a port-hole formed in the lower part of the circle, a feature peculiar to the tombs of the site. None of the chambers bears at present a capstone.

The chamber consists of a monolithic orthostat at the rear and two on each side. The sides near the front slightly converge by making an angle at the junction of the two uprights so as to form the narrow entrance opening. From the entrance proceeds the short passage into the port-hole of the circle (Pl XV,; 1,2. Fig. 31,; 1.). Sometimes the space in between the entrance and the port-hole of the circle is too small for a passage (Pl. XV, 3-4. Pl. XVI, 1; Fig. 31, 2-3).

The enclosing circle more or less maintains a normal size of about 3.50 m. diameter externally and constists usually of 13 to 15 stones, which is also a noteworthy feature. The stones of the circle are so arranged as to leave a small space in front of the passage. The top corners of the stone blocks flanking the gap are cut-off so as to fit in the other stone block to cover the

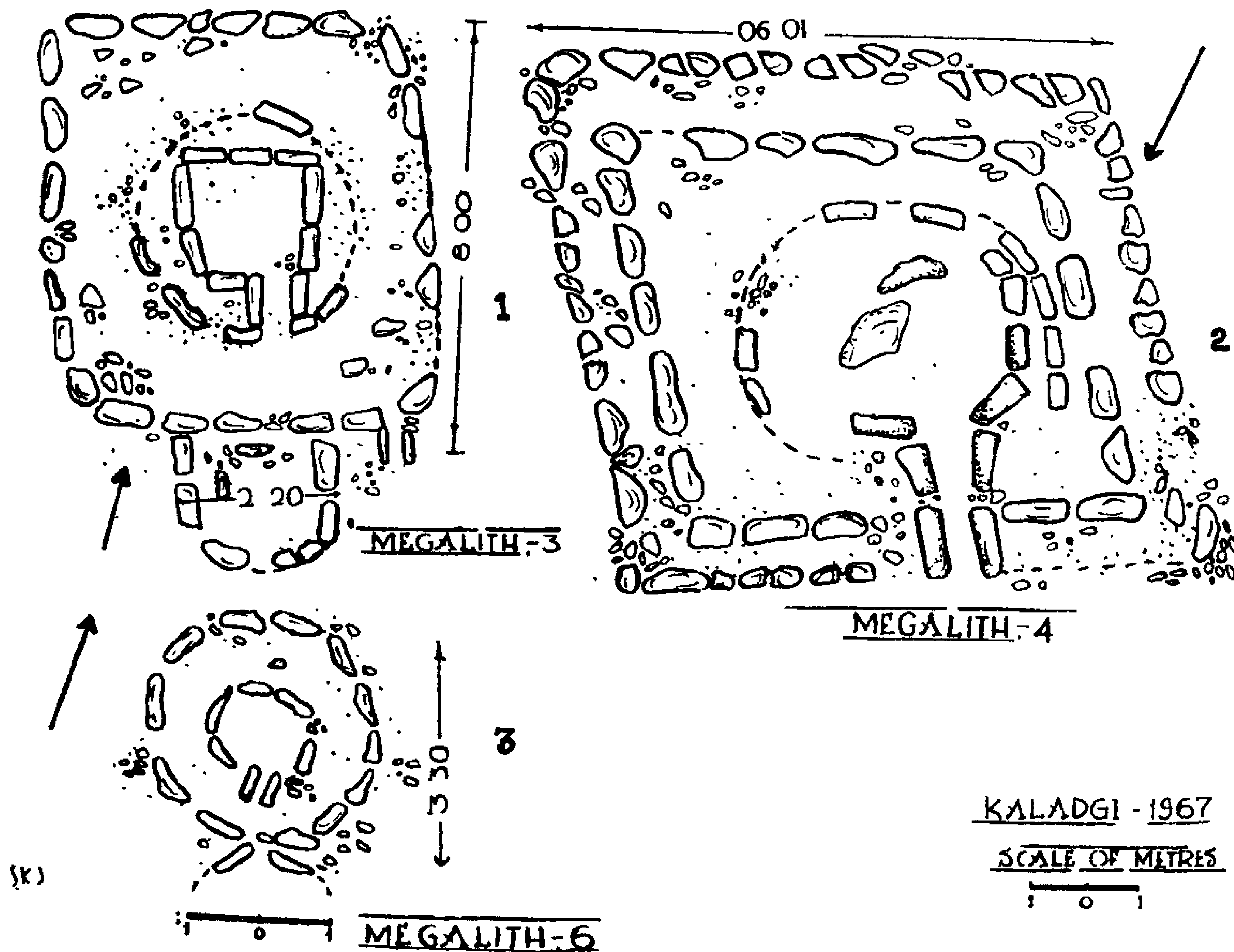


Fig. 31

gap at the top (Pl. XVI; 5). Sometimes even at the bottom of the gap is placed a small block of stone. Consequently, the gap left is narrowed and becomes an opening i.e. a port-hole leading to the passage. This is entirely a novel method and a unique feature of the tombs.

The space left in between the circle and the chamber is generally very small. Stone rubbles are thinly spread in between the chamber and the circle. But there is no cairn packing on all sides to the main chamber. How the chamber was originally concealed cannot be known from the present state of the evidence. Only there is sprinkling of stone rubbles in and around the chamber and around the circle.

The orientations of these passage chambers, unlike that of the passage chambers of Konnur[3] and other sites,[4] are remarkably varied. Broadly speaking, some are looking west; some, north-west and north; some, south and south-west and very few, east and between north-east and south-east. This is another feature of the passage chambers here. A majority of them are oriented between west and north, and those oriented between south-south-east and south are next in number.

Occasionaly, some minor variants in this type occur. For instance a chamber may be longitudinally divided into two compartments by just inserting another orthostat in the middle, parallel to the sides (Pl. XV, 4; Fig. 31, 3).

Sometimes, the sides of a chamber are straight without a bend, but converge towards the front to form a narrow entrance. In this case the chamber looks elongated tapering towards the front. Or in front of the passage and outside the circle, two stones with a gap in-between, are placed like horns abutting the flaking stones of the part-hole, to form a concave facade. (Pl. XVI, 3. Fig. 32; 3). Or the chamber may be circular on plan (Pl. XVI; 3; Fig. 32; 3). Infrequently there may be two more concentric circles or a circle and a rectangle enclosing the chamber (Pl. XVI; 2. Fig. 32; 1, 2). The outermost circle or rectangle has a passage in alignment with that of the chamber (Fig. 32; 2). In some case it was noticed that the passage in the enclosing rectangle is near the corner instead in the middle and is out of the alignment (Fig. 32; 1). And this rectangle has a semi-circle in the middle on the outside (Pl. XVI,; 2. Fig. 32, 1).

Generally, the chamber internally measures about 0.75 m. at the back and 40 cm. at the front by 2 m. long or 1.10 m. at the back and 35 cm. at the front wide by 1.20 m. long to 1.70 m. at the back and 75 cm. at the front wide by

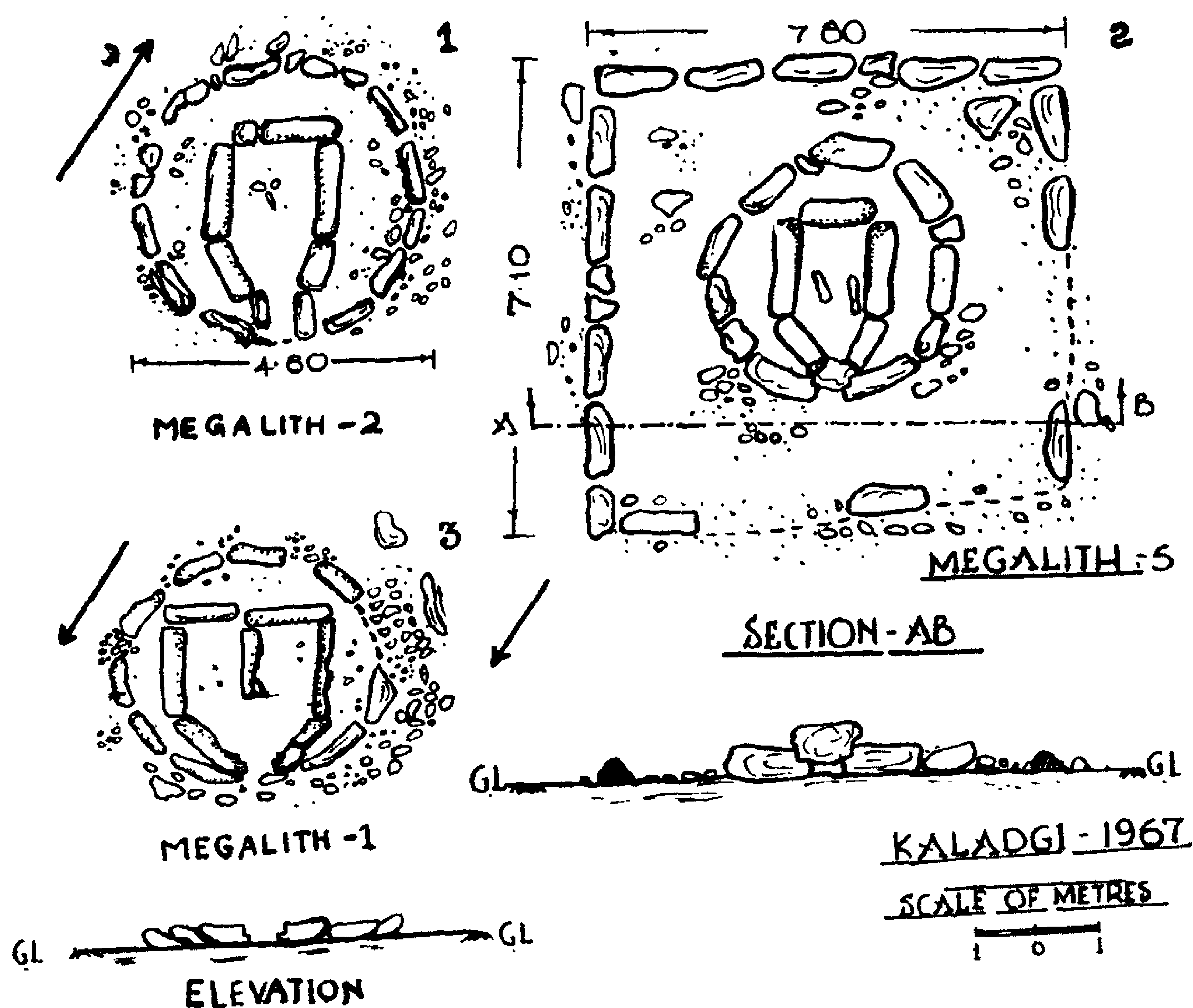


Fig. 32

2.20 m. long. The height varies from 50 cm. to 75 cm.. The passage generally measures 40 to 60 cm. long and from 30 cm. to 45 cm. wide and about 10 cm. high. The immediately enclosing circle ranges from 2.20 m. to 4.80 m. externally in diameter, the diameter between 3.30 m. to 3.70 m. being the most common and about 10 to 30 cm. high. The port-hole in the circle is about 33 cm. wide and 40 cm. high. The two outer concentric circles of the passage chamber measure about 5.20 m. and 8.20 m. in diameter. The outermost rectangle measures 8 m. by 11 m.

The interlocking of the orthostats is simple; neither clock-wise nor anti-clockwise. The stones of the circles are closely juxtaposed. And the rectangle usually consists of two rows of boulders with stone rubbles in between and usually 1 m. wide.

2. STONE CIRCLES

As mentioned above, there are, in all, five stone circles without chambers in the interior. In two cases it was doubtful whether they were indeed without chambers. It is quite likely that passage chambers in them might have an opening in the circle looking W 290° N and a small block of stone within. The rest are most probably without chambers.

One of the circles is oval shaped, measuring externally 4.10 m. (N–S) by 4.80 cm. (E–W) in diameter. Another is a joint circle, one being smaller than the other and measuring 2.10 m. and 2.60 m. externally in diameter. There is another double (concentric) circle of 1.60 m. and 2.55 m. in diameter.

Raw materials and dressing

All kinds of the local stones, i.e. laterite, quartzite or quartzitic sandstone, limestone, conglomerate have been well exploited for building the megaliths. Among them laterite is by far the most common as it is freely and readily available in plenty and generally in suitable forms, while quartzitic sandstone or quartzite is the next. Even though the megaliths are situated on the top of the hill, it is considerably less used as it occurs in boulder forms and not in slabs convenient for the construction of chambers. There are about twelve megaliths completely of laterite and many others have used, especially for circles, of the same stone. Quartzitic sandstone boulders are used only for the circles and rectangles and never for the chambers. Infrequently, laterite and quartzite are found together, of course the former being predominant, in one circle. Limestone slabs, greyish black in colour are occasionally used for chambers only (Pl. XV; 4) as they are found in slabs of irregular thickness and forms, and in much less quantity on the surface. Conglomerate boulders are confined only to the circles of a few megaliths (Pl. XVI; 4).

Laterite of course occurs in rectangular blocks of various sizes. The stones used in the megaliths, are however, a little dressed so as to arrange them

properly in a circle. The exterior usually is made slightly convex perceptible only to the keen eye. There is clear evidence of cutting the blocks nicely wherever necessary. The cutting of the top corners of the two stones forming the opening in the circle to accomodate the capstone is a very good instance. Likewise, the conglomerate blocks of the circle are neatly cut into rectangular blocks which is comparatively difficult. There is no indication that the quartzitic sandstone, boulders and limestone slabs have any dressing.

Antiquities

Even though most of the passage chamber tombs are disturbed, no antiquities such as pottery, human bones etc. are scatterred on or near any of the megaliths.

General observation on the megalithic site

1. Like the sites of the areas of Hidkal, Konnur, Honnin-Mavanur, Terdal, Saundatti and Aiholli, the site here is situated on the top of the hill commanding the view of river Ghataprabha and the vast plain suggesting the builder's fascination for the river valley environment in the hilly terrain.

2. The megaliths are located near one another. In an area of about 8 to 10 acres there exist about 43 megaliths.

3. There is only one type of megalithic tombs : a chamber with its sides partly converging into a short passage in the front. The passage is on lower plane than the chambers and it opens into a port-hole formed in the circle enclosing the passage chamber. This again may be surrounded by two other articles or a circle and a rectangle.

4. The irregular hexagonal form of the chamber; the division of the chamber into two compartments, but with a common passage or entrance; provision of a port-hole and the strikingly different orientations of the passage chambers (looking west, north-west, north, north-east, east, south-east, and south-west are the distinctive features of this site. In all other sites the passage chambers are rectangular or trapezoidal on plan, with a distinct, usually long passage and invariably oriented towards the south or in between south-west and south-east. They are enclosed in a rectangular or a circle or in a double circle or in a circle and a rectangle. Further, never in the circle or rectangle, a port-hole is provided. We have already noticed that at this site the passage chamber is never enclosed in a rectangle exclusively. And sometimes the passage is too indistinct.

The passage chambers do not seem to have been buried in the cairn of stone rubbles.

5. It is noticed above that the plan of the chamber is peculiarly hexagonal. It appears that the builder had purposely used this device in order to provide

maximum space in the interior of the chamber enclosed in a small circle. Suppose the front orthostats are at right angles with the side orthostats, then the chamber would be rectangular and the passage longer, like that of the passage chamber of the other sites. If this method is followed in the megaliths of comparatively smaller size the interior area of the chamber becomes very small. The contrivance employed at this site was perhaps due to the local geology that provides blocks of stones of usually smaller size.

6. The megaliths are mostly of ordinary size in height and areas. However, the outer concentric circles or a circle and a rectangle of very few megaliths are reasonably large in dimensions.

7. No antiquities[5] suggesting the chronology and the affinity of these with the others known from the Deccan and South India could be obtained from the site. However, the architectural features such as the passage, the enclosing circle and rectangle or two circles and of a passage in them in alignment with that of the chamber, suggest their affiliations with those of the passage chambers of other sites. Excavations of the passage chambers of Terdal and Halingali and the collections of antiquities from the some of the sites at Hidkal, etc. show that the antiquities particularly the pottery,—the red-ware, the black-and-red ware,—in types and fabrics, is closely analogous to that of the stratigraphically excavated sites at Maski, Brahmagiri and others. Thus the megaliths of the site in question, may be said to belong to the known megalithic cultural complex.

8. The geology of the area favourable for the megalith builders was because of various rock materials in suitable forms or easily amenable to the requirements. Stones of different kinds in the locality had been dexterously cut and dressed and the megaliths were built.

9. So far as the presence of a port-hole in the circle is concerned, there is one site in Tamil Nadu that can be compared with this site. A cist-circle at Iralabanda Bapanattam[6] (Palamaner Taluka, North Arcot District) has a triple circle of stones of dressed slabs with semi-circular and rectangular tops arranged alternatively. In the uprights of the circles, port-holes are caused in alignment with the port-hole on the eastern orthostat. In this, the port-hole is cused by perforation, like that of the known port-holed chambers of other sites; but in Kaladgi, by certain structural construction, a method known only from this site.

PLATES AND FIGURES

(Note : Meg = Megalith.)

Plate XV, 1, 2. Fig 31; 1 : A passage chamber tomb (Meg-2 in Fig. 31). Note the slight angular bend of the side orthostats for convergence towards

the front and the short passage of low height. The orthostats are laterite; the flanking uprights of the passage are of limestone and the circle stones, of conglomerates.

Plate XV, 3 : A similar passage chamber tomb. In this the passage is not conspicuous. Note the opening in the circle in alignment with that of the chamber. The orthostats of the chamber are of limestone and the circle stones, of quartzite.

Plate XV, 4 and Fig. 31; 3 : A chamber with a special slab dividing it into two compartments. In this the converging uprights of the chamber just touch the circle at the port-hole. Note the hewing of the top corners of the blocks flanking the port-hole and the provision of a small stone at the bottom of the port-hole. Note the dressing of the laterite blocks of the circle. While the uprigths of the central and the right side of the chamber are of lime-stone, those of the left side, the rear and of the circle, of laterite.

Plate XVI, 1 : A chamber tomb similar to that of Pl. XV 3 and 4 but without septal slab. There is a gap in the circle, serving as port-hole originally, in alignment with the entrance of the chamber. In this also, the top corners of the circle stones flanking the port-hole are cut. A rectangle encloses the circle containing the chamber. The megalith is entirely of laterite.

Plate XVI, 2 and Fig. 32; 1 : The passage chamber is rather disturbed and more so the enclosing circle. Note the surrounding rectangle which has also the passage near the south-east corner, but not in alignment with that of the chamber. There is a semi-circle added to the exterior of the rectangle.

Plate XVI, 3 and Fig. 32; 3 : The chamber is roughly circular with a passage terminating near the opening of the circle which has two stones on the exterior attached like horns forming the concave façade to the opening.

Plate XVI, 4 : Illustrates how a capstone is fixed into the hollows of the top corners of the circle stones forming the port-hole.

Plate XVI, 5 : Neatly cut blocks of conglomerate used for the circle surrounding a passage chamber. See also Fig. 32, 1.

Figure 32; 2 : A passage chamber enclosed in a circle which in turn is surrounded by a double rectangle which also has a passage in alignment with that of the chamber. The chamber is of limestone, the circle of conglomerate and the rectangle of quartzite.

(Note the different orientations of chambers with or without passage illustrated in Figures 31 and 32).

NOTES :

1. *Gazetteer of Bombay Presidency*, Vol. XXIII, Bijapur, 1884, p. 32.
2. So far characteristic passage chamber tombs (without port-hole) have been reported only from the region of North Mysore State (popularly known as North Karnatak).

The earliest known site is Konnur, Gokak Taluk, Belgaum Dist., reported by James BURGESS in the *Report of the Arctaeological Survey of India* (New Imperial series), 1884, p. 8 and in *Indian Antiquary*, Vol. III, 1874, pp. 306-38, with illustrations. Line drawings and a good photograph of a passage chamber from this sight appear respectively in the *Gaztteer of Bombay Presidency, Vol. XXI*, Belgaum, 1884, facing p. 583 and in the '*Chalukyan Architecture*' (COUSENS, H.), *Plate* CLII.

A typical passage chamber tomb is rectangular or trapezoidal on plan, with a verticle gap in the middle in the southern side, functioning as entrance approached by a passage of lower height than that of the chamber; enclosed in cairn packing which in turn is surrounded by either a circle or a rectangle or by both. It is entirely built of huge undressed slabs usually of sandstone.

Megaliths subsequently discovered at Terdal, Halingali and other localities nearby and at Bhairavanpada (Chatnalli) by Annigeri (see *Annual Report of the Progress of the Kannada Research Institute*, 1944-45, p. 23, 1947-52, p. 22) and at Manoli (the site is actually in the Revenue limits of the nearby village, Sindhogi) by R. V. JOSHI (see *Bulletin of the Deccan College Research Institute*, Vol. XI, No. 1, p. 66) and at Maskanal (see *Journal of the Bombay University*, Vol. XIV, 1946, part IV, pp. 10-28), are identified as passage chamber tombs by me. Illustrations of the excavated and other megaliths by MUNN, in Lingsugur (Dist. Raichur) area, (see *Annual Report of the Archaeological Department of the former Hyderabad State*, 1927-28, pp. 25, 38, plates H and I) show that some of them are passage chambers, built of granite boulders, typologically similar to those of Konnur and of the circular passage chamber in Terdal typologically similar to that of Konnur and of the circular passage chamber in Terdal and Halingali.

In my explorations I discovered the following 28 sites with passage chambers, in 1964-67.

No.	Locality.	Taluka	District	Situation
1.	Harali (Bk) and- (Kd)	Gadhinglaj.	Kolhapur.	On the banks- of the river Hiranyakeshi.
2.	Ainapur.	,, ,,	,,	,, ,,
3.	Hattargi. (and Dadban hatti)	Hukkeri.	Belgaum.	On a tributary of the river Ghataprabha.
4.	Jinral.	Hukkeri.	Belgaum.	Near the Ghataprabha river.
5.	Hunnur.	Hukkeri.	Belgaum.	On the banks of the Ghataprabha river.
6.	Badkundri.	,,	,,	,,
7.	Hidkal.	,,	,,	
8.	Nirvanhatti.	,,	,,	
9.	Hidkal Camp.	,,	,,	
10.	Gudikyatara.	,,	,,	,,
11.	Godgeri.	,,	,,	,,
12.	Sultanapur.	,,	,,	,,
13.	Savalgi.	,,	,,	,,

No.	Locality	Taluka	District	Situatiou
14.	Godchanmalki.	Gokak.	„	On the banks of Markandeya river.
15.	Honninamavanur.	,,	,,	,,
16.	Gumchimaradi.	,,	,,	,,
17.	Sigavalli.	Gokak.	Belgaum.	On the banks of the Markandeya-river.
18.	Gaddihalli.	,,	,,	,,
19.	Urabanhatti.	,,	,,	,,
20.	Muchandi.	Belgaum.	Belgaum.	
21.	Saundatti.	Saundatti.	,,	Near the banks of the Malaprabha river.
22.	Kaladgi.	Bagalkot.	Bijapur.	On the banks of the Malaprabha river.
24.	Kaldevanhalli.	Muddebihal	Bijapur.	—
25.	Hegaratgi.	Shorapur.	Gulbarga.	—
26.	Daminhal.	,,	,,	—
27.	Kodekal.	,,	,,	—
28.	Tavaragera.	Kushtgi.	Raichur.	—

(Note : In the megalithic site at Hunnur, is a non-sepulchral megalithic monument, built of undressed stones against a slopy out-crop of sandstone; first of its kind, locally called "Laddi Sabana gudi").

Excepting Terdal and the nearby localities and Kaladgi, the passage chamber tomb in all the other sites is essentially similar to that of Konnur. Occasionally long barrows normally with two or three passage chambers are found at Hunnur, Hidkal, Nirvanhatti, Godgeri. Especially the biggest barrow containing more than seven chambers, (measuring about fifty metre long, twenty-five metre wide, and about one metre to two and half metre high) at Godgeri is noteworthy. The passage chamber tombs in Terdal, Halingali, and the nearby localities are different in types : one type looks like a Greek or Latin cross or the earliest Brahmi letter *ka* on plan and the other in the circular chamber with passage on the south. I have described these types in my paper, "Some new types of megalithic monuments near Terdal and Halingali, Jamkhandi Tahasil, Bijapur Dist., Mysore State", in the *Quarterly Journal of Mythic Society*, Vol. 57 (in press). Of these two of the first type, one of the second and two cairn stone circles were excavated under the guidance of SANKALIA by me in 1965-66. From many of the disturbed and excavated tombs of this and other sites, red ware and black-and-red ware pottery in fragments; iron objects and objects and human bones in pieces, were collected. The pottery, in fabrics and types, is closely analogous to that of Maski and Brahmagiri (see *Ancient India*, No. 13, pp. 4-143 and No. 4 pp. 181-310). Three noteworthy features, in particular, of these megalithic passage tombs are : their situation near the rivers in the hilly terrain; invariable south orientation of the passage and the greater frequency of the red-ware pottery, as one of the items of burial furniture.

The other site with the passage chamber tombs is Sanur, Chingleput Dist., Tamilnadu (see *Ancient India,* No. 12, plate VI and No. 15). Here, it is built of granite boulders and rubble and is typologically similar to the circular passage chamber of Terdal etc. and of Lingsugur, but comparatively is incipient. No slab-built passage chambers have been hitherto noticed here and in other areas. At the moment, therefore, typical passage chambers comparable to those of Western Europe (see, Glyn DANIEL, *The Megalith Builders of Western Europe,* (1962) and Dorothy DAVISON, *The Story of Prehistoric Civilizations,* (1951) are known only from North Karnataka.

3 and 4 : Note 2.

5. Here retouched blades and flakes on chert are found.

6. Branfill, B. R. : "Rude Megalithic Monuments in North Arcot", *Journal of the Asiatic Society of Bengal,* (1880) pp. 8-10.

VEMULA INDUSTRY IN CUDDAPAH BASIN

K. THIMMA REDDY

THE CULTURAL sequence in Indian prehistory is the Early Stone Age and the Middle Stone Age succeeded by the Late Stone Age. Unlike Europe, West Asia, and Africa, in most parts of the Indian sub-continent the flake industries of the Middle Stone Age complex seem to have been followed directly by the Late Stone Age Microlithic Industries. But the recent researches under the guidance of Prof. H. D. SANKALIA by various researchers have brought to light sporadic evidence of the blade-burin industries which are tentatively fixed between the Middle Stone Age and the Late Stone Age.

The prehistoric cultural sequence of Cuddapah, in Andhra Pradesh, falls with the traditional Stone Age sequence of the country viz., the Early, the Middle and the Late Stone Age. The raw material, quartzite being common, the traditions of both typology and technique of making tools differentiate the Early and the Middle Stone Age industries while the Late Stone Age industries, in this region, are distinguished with the changes in raw material, typology and technique from the preceding industries. But the industry discovered at Vemula in Pulivendla taluk of Cuddapah district forms a class of its own, with a distinction in raw material and typology from that of the Middle and the Late Stone Age industries. Chert which is available in the shape of pebbles, derived from the nearby conglomerate small hillock is used as raw material; while a change in the raw material is noticed only during the Late Stone Age in the Eastern and Northern parts of the district.

Vemula village is about 10 km. south-east of the Pulivendla town. The collection of aftefacts has been made from the foot hills lying in the east-west direction to the Vemula tank. The number of arefacts collected from this area is 177 in all which include tools on flakes, blade flakes and blades; cores and waste flakes. Chert of dull red colour is the chief raw material while a few specimens are made on chalcedony and two on basalt.

The technique employed in the manufacture of tools is the same as that noticed in the case of Middle Stone Age tools, viz. 'bone billet' or 'punch' method. Retouch, in most of the cases, is oblique while some exhibit steep retouch. Faceted platform is predominant in blade flake while it is less prominent in the flakes. This indicates the application of the 'prepared core' technique also.

The artefacts are divided into (a) tools; (b) cores; and (c) flakes. There are 86 tools, 24 cores and 67 flakes in this collection.

I. Tools

These are grouped under tools on (A) Flakes; (B) Blade flakes and (C) Blades.

(A) *Tools on Flake* (34) : These are irregular flake tools. Eight specimens possess the faceted platforms. This group is further divided according to the nature of the working edge.

(i)	Unilateral	.. 7
(ii)	Bilateral	.. 5
(iii)	Terminal	.. 5
(iv)	Convex	.. 7
(v)	Rounded	.. 7
(vi)	Pointed	.. 3

(i)	Unilaeral ..	End struck; triangular outline; truncated cone cross-section; two parallel ridges on the dorsal; retouch along one lateral side; fresh. Fig. 33/1.
(ii)	Bilateral ..	Oblique retouch on the ventral along the two sides, slightly patinated. Fig. 33/2.
(iii)	Terminal ..	Retouch on the convex terminal end; cortex on the dorsal.
(iv)	Convex ..	Semi-circular outline; steep retouch on one side while the convex edge is obliquely retouched. Fig. 33/14, 15, 16.
(v)	Rounded ..	The retouch is carried around the periphery. Steep retouch around the periphery; chalcedony Fig. 33/4.
(vi)	Pointed ..	A negative flake with a ridge on the dorsal; retouch on the pointed end; patinated.

(B) *Blade Flake* (30) : These are end struck, the length of the flake is at least twice the breadth or they have parallel sides. There are 14 faceted-platform tools in this group. They fall under the following types.

(i)	Unilateral	.. 16
(ii)	Bilateral	.. 4

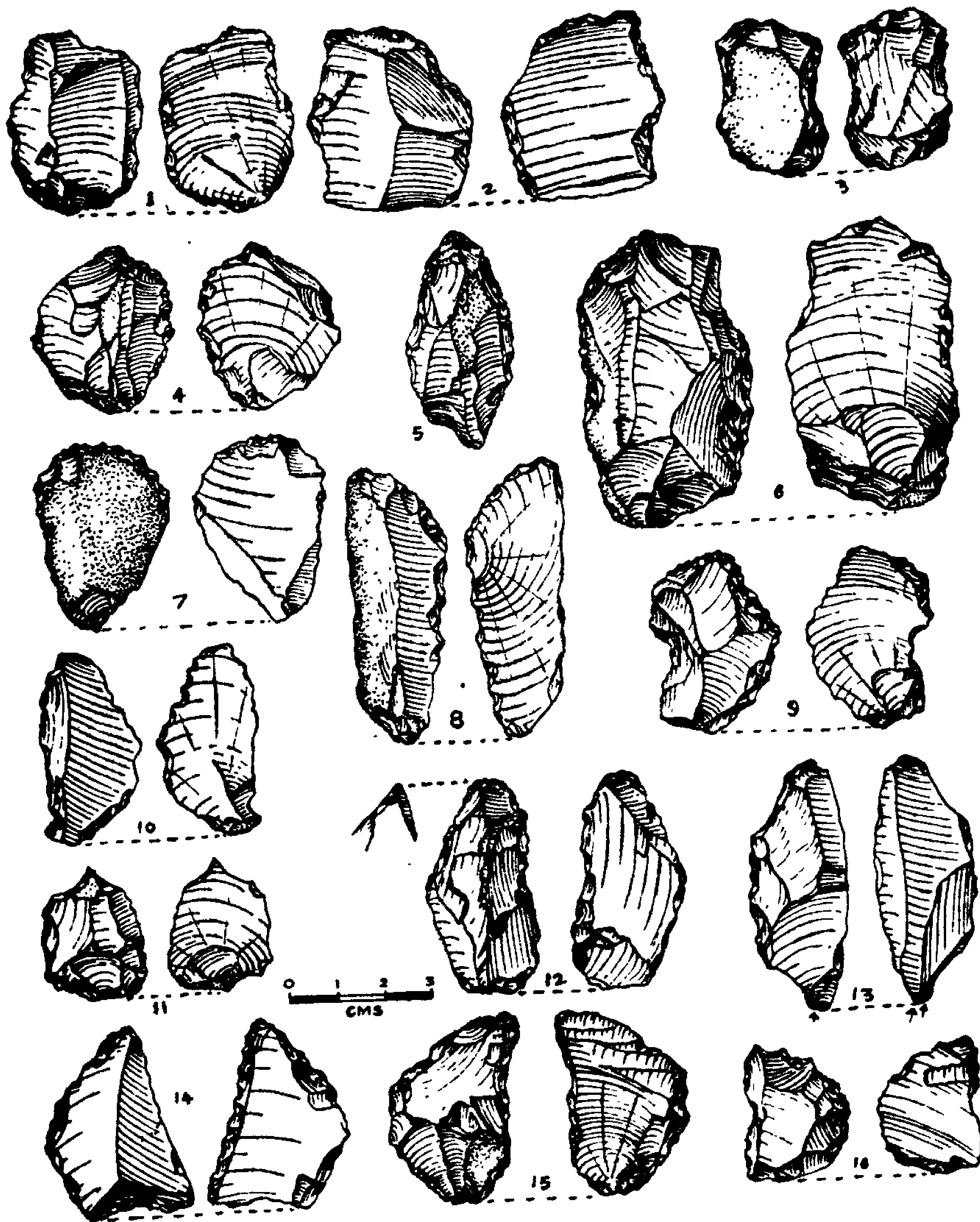


Fig. 33

(iii) Terminal .. 2

(iv) Concavo-convex .. 1

(v) Points .. 3

(vi) Burin or chisel edge .. 2

(vii) Rounded .. 2

(i) Unilateral	..	Roughly rectangular; three faceted; a symetrical plano-convex cross-section; deeply patinated. Fig. 33/6.
(ii) Bilateral	..	Double notch; steep retouch. Fig. 33/3.
(iii) Terminal	..	Elongated; plano-convex cross-section; retouch along oblique terminal end; fresh. Fig. 33/8.
(iv) Concavo-conxex	..	Leaf shaped; steep retouch, chalcodony, fresh. Fig. 33/9.
(v) Points	..	Tanged point; leaf shaped, basalt. Fig. 33/10.
Borer	..	One deep small flake scar on the dorsal; two small flake scars at the distal end; fresh. Fig. 33/11.
(iv) Burin	..	Bevel burin edge; oblique spall on either side of the burin end; fresh. Fig. 33/12, 13.
(vii) Rounded	..	The working edge on these tools is all around the periphery. Fig. 33/16.

(C) *Blades* (22) : Majarity of them are small in size. They are made on chert and a few on chalcedony. They are grouped as under.

(i) Unilateral	..	11
(ii) Bilateral	..	11

(i) Unilateral	..	There are six specimens with straight edge, three have oblique edge while the remaining two are knife blade. Fig. 34/4, 6.
(ii) Bilateral	..	Retouch along the two parallel sides. One blade is made on basalt which is deeply patinated. Fig. 34/2, 3.

II. CORES :

All the cores are on chert except two cores on chalcedony and one on agate. The blades are removed either in one direction or two directions. They fall under the following categories.

(A) *Prismatic cores* (15) :

These are again grouped as under :

(i) Fluted cores	..	12
(ii) Flat Cortical base cores	..	3

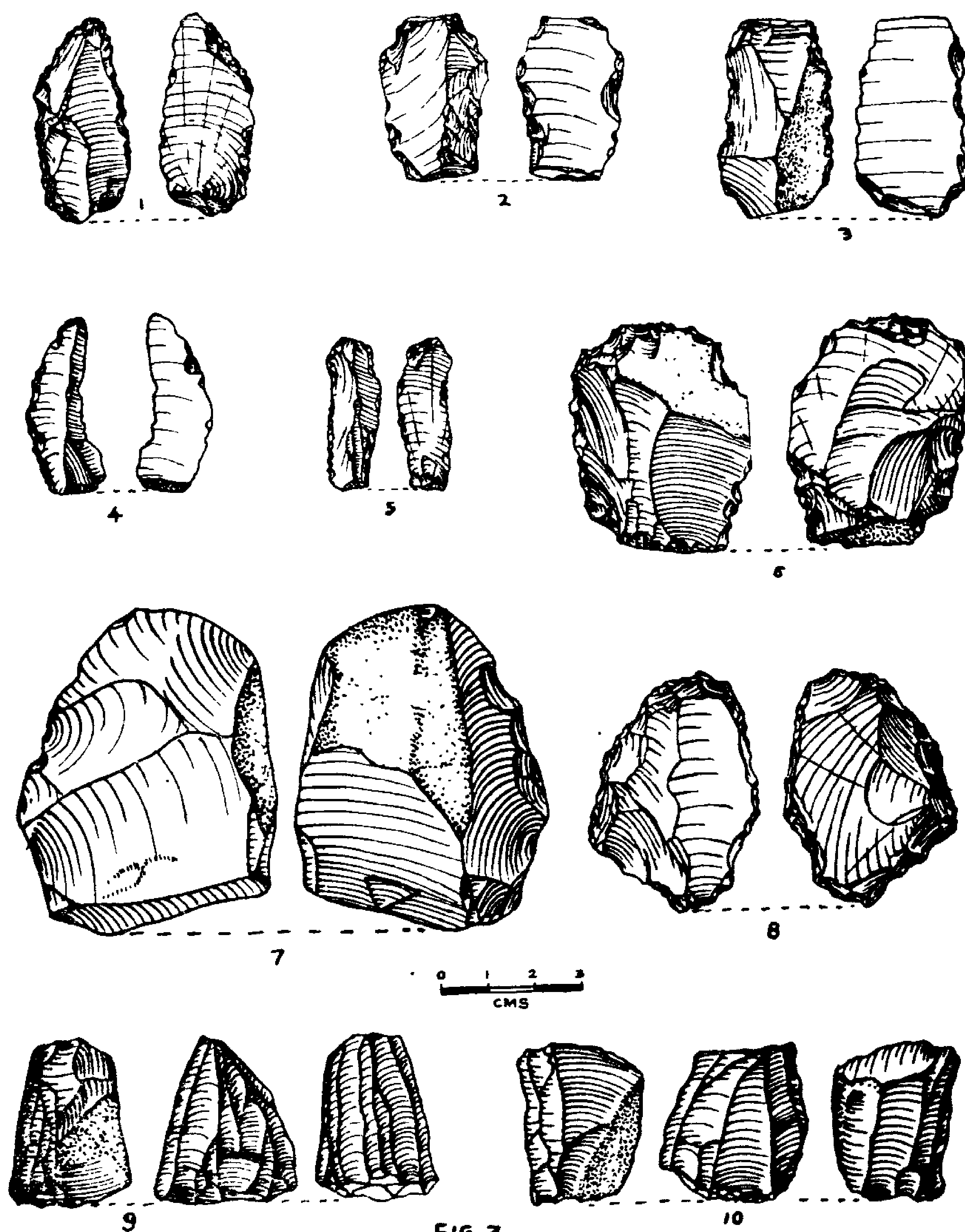


Fig. 34

(i) Fluted cores : There are 10 single platform cores while the remaining two have two platforms.

(ii) Flat cortical base core : Flakes are removed flatly towards the centre from the edge around the periphery leaving the flat cortical base untouched.

(B) *Flake cores* (5) :

Flakes and blades are removed irregularly on chert nodules. Only a few flakes and blades are removed leaving the rest with cortex.

(C) *Irregular cores* (4) :

These are non-descriptive. All of them are on chert.

III FLAKES (67) :

These are not tools. But taking the advantage of the sharp edge that some of them possess, they are used either directly or slightly retouched here and there, while the rest are either unused or waste products. They possess the same physical characteristics as those of tools but do not fall under tool types. Out of the total 67, flakes are 36 while the blade flakes are 13 in number. There are 7 faceted flakes among 36, out of which 4 are slightly retouched. There are 16 core rejuvenation flakes.

A close examination at the Middle Stone Age Vemula and the Late Stone Age industries from Cuddapah district, will reveal a vast difference in physical features from each other. When analysed statistically, they confirm the observations. Firstly the ratio of Blades, Blade flakes and flakes in the flake tool complex of the Middle Age is 9:32:59; while at Vemula it is 26:35:39. The ratio of the blade element at Vemula when compared to the Middle Stone Age tool kit is higher. Secondly the average measurements of the length, breadth and the thickness of the Middle Stone Age Vemula and the Late Stone Age industries are as given below.

	Length	*Breadth*	*Thickness*
M.S.A.	5.3 cm.	3.7 cm.	1.6 cm.
Vemula	3.73 ,,	2.38 ,,	0.99 ,,
L.S.A.	2.44 ,,	1.58 ,,	0.66 ,,

Thirdly the typology in the Vemula industry shows an improved technique of manufacture from that of the Middle Stone Age.

The above facts show that the Vemula industry exhibits a striking difference from those of the Middle Stone Age and the Late Stone Age industries. Dr. L. VERTES from Hungary who examined the material and analysed it statistically, also confirmed my observation that the Vemula industry is distinct from those of the preceding and succeeding industries of the Middle and Late Stone Age. It is to be seen whether these features attribute Vemula a separate cultural entity against the background of the known blade-burin cultures from the adjoining districts of Chittoor, Kurnool, Guntur and Nellore.

Renigunta (MURTY, 1968, 83-101) in Chittoor district has brought to light a typical blade industry made on quartzite. Out of the total of 834 full size

specimens, blades are 400 in number, burins 56, back-blunted blades 73, points 5, scrapers 6, awls 2 while others such as cores, flakes, chips and core flakes amount to 292 in the total. The greatest number of artefacts fall in the length class of 4.1 to 4.5 cm. All the tool types except the back-blunted blades of Renigunta are also found at Vemula. The Renigunta industry exhibits perfect workmanship as seen from the tool sizes also. But Vemula industry lacks in this perfection and is smaller in size.

The upper palaeolithic (Series III) tools are reported from Kurnool district (ISAAC, 1960) from Series III gravels. They appear first with series II gravel yielding the Middle Stone Age tools. The tool types include points, scrapers, axe types, borers, burins, picks, crescentic types, trapezoidal, flake blades, blades, awls and cores. The secondary working is characterised by blunting and truncation technique, nibbling and pressure chipping. The raw material is quartzite, chert, slate, etc.. A comparative study of the Upper Palaeolithic and the Late Stone Age industries of Kurnool region reveals that the former falls more on the latter. Vemula industry differs from those of the Kurnool district in typology and technique except the scrapers, poins, borers, burins, blades and blade flakes the rest of the tool types of Kurnool are absent at Vemula.

An Upper Palaeolithic industry is reported from Nagarjunakonda by SOUNDARARAJAN (1958; 59). The implements are made on flakes, blade flakes and blades. The techniques employed are developed form of Levalloise method and punch method. The total types include points, scrapers, awl-points, burins and scraper cum perforators. The raw material is fine grained flinty chert or jaspery quartzite of greenish grey hue. As it can be seen from the illustrations the industry that is labelled as Upper Palaeolithic tends more towards the Late Stone Age. The Vemula industry differs from that of the Nagarjunakonda.

MANLEY collected, from Nellore (AIYYAPPAN, 1942; 19), Upper Palaeolithic tools. The tool types include blades, diminutive handaxes, scrapers, awl-points, and burins. It appears from the description of the above tools that they are crude in nature and hence their doubtful association with the Upper Palaeolithic curture.

Although there is no industry known so far that can really be called as Upper Palaeolithic, yet some sporadic occurrence of blade flakes and blade tools occurring either singly along with the Middle Stone Age industries or as assemblages in post-Middle-Stone-Age times might represent a transitional phase filling the gap between the Indian Middle and the Late Stone Ages which in the other parts of the world is characterised by a sequencial development of Upper Palaeolithic industries. Whereas the Upper Palaeolithic industries in the other parts of the word are confinel to the Upper Pleistocene, the lack of any datable evidence makes it difficult to fix such assemblages in India, referred to above, in the inter continental cultural framework. However, the Vemula industry

with its striking features in raw material, technique and tpology differentiating from the Middle and the Late Stone Age culures and suggesting a transitional phase between the Middle and the Late Stone Age, adds yet one more element to the existing prehistoric archaeological data in this country so as to suggest that more investigations in this region might possibly reveal a synonymous if not contemporaneous industry with the Upper Palaeolithic.

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THE CONCEPT OF MADHURA BHAKTI IN INDIAN PHILOSOPHY

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THE CONCEPT of Madhurā Bhakti finds an important place in the history of Indian Philosophy, and its impact is felt very dominantly on its religious thought. But, before we proceed to discuss the concept of Madhurā Bhakti, it is necessary to make it clear, in the beginning, what we mean by the term '*mādhuryya*'. First reference to it is found in the period of the *Mahābhārata*. It was normally used to convey the meaning : 'beautiful' or 'attractive'. It is referred to by Bharata while discussing the *kāvyaguṇas* in his *Nāṭyaśāstra*. The word '*mādhuryya*' has been attached great importance by Mammaṭa and Viśwanātha also, in their works.

In Bhakti Literature, the term '*mādhuryya*' is, for the first time, mentioned in the works of Rupagoswami, who belonged to the 16th century. It is endowed with a special significance. It is used to connote *sarasatā*. It may be also noted that the term *mādhuryya* is used to signify *bhāva* and not *bhakti*. In both of his works, viz. *Haribhaktirasāmṛita* and *Ujjvalanīlamaṇi* Rupagoswami used the term *Madhurā Bhakti* to denote *Bhakti* with *kāntābhāva*. Again, this *bhāva* is classified into two types, viz. (i) *Aiśvaryabhāva* and (ii) *mādhuryabhāva*. This necessiates the explanation of these two terms. What is the meaning of the terms *aiśvaryabhāva* and *mādhuryyabhāva* and wherein lies the difference between the two ? Viswanatha describes them both and explains it effectively.

(i) *Aiśvaryabhāva* :

What is meant by *aiśvaryabhāva*? According to Rupagoswami *aiśvaryabhāva* arises, when the Lord manifests Super-human powers. Love or devotion, which arises in the heart of a devotee about the Lord, seeing His Super-human Powers, is termed as '*aiśvaryabhāva*. In this case, it is difficult to cultivate *ātmīyatā* as is possible in the case with *mādhuryyabhāva*.[3]

(ii) *Mādhuryyabhāva* :

A devotee, who possesses *mādhuryyabhāva* does not look upon the Lord as a Super-human Being. Here, the Lord is looked upon as a near relation

like father, brother, etc. Because of this inner relationship, love is fostered, which ultimately culminates in the union with the Lord.

In the works of the poets from Vraja who were devotees of Krishṇa, prominence is given to *mādhuryyabhāva* and there is absence of *aiśvaryabhāva*.[4] After illustrating the difference between these two terms, we shall try to explain, in more details, the concept of *mādhuryyabhāva*.

Mādhuryyabhāva is inclusive of different *rasas*, viz., *śānta, dāsya, sakhya, vātsalya* and *madhura*. All these are included in *mādhuryyabhāva* and are even indispensable. However, *śṛiṅgāra rasa* is held in prominance. It may be also noted that *śṛiṅgāra rasa* is inclusive of the rest of the *rasas*, viz., *dāsya, sakhya, vātsalya*.[5]

Our next question would be, how *utkarṣa* of *mādhuryyabhāva* would take place? And the answer to it would be, when one would look upon Krishṇa as husband and cultivate *kāntābhāva*. As Dr. Hazari Prasad puts it, "*kāntābhāva*, i.e. looking upon the Lord as husband is most *manorama*".[6] This is because, it is the closest relationship with the Lord of all the relationships. That is why Chaitanya Mahā Prabhu and Āchāryas like Goswāmī Hitaharivaṁśa and Swāmī Haridāsa have extolled it.

Madhurā Bhakti :

We shall further investigate, what is the exact meaning of the term *Madhurā Bhakti*, when we use it in course of our discussion. *Madhurā Bhakti* is termed as such after the *mādhuryyabhāva* with which it is performed. *Upāsanā* is described as *Madhurā Bhakti* according to the form of devotion with which the devotees are devoted to the Lord. Here, oneness of the devotee with the Lord is of the kind of unity of the bride with her husband. This signifies complete union of the devotee with the Lord.

Kinds of Madhurā Bhakti :

Madhurā Bhakti is classified into different kinds according to the *Bhāva* with which it is practised. These *bhāvas* are (i) *kāntābhāva*, (ii) *gopībhāva* and (iii) *sakhībhāva*.

This naturally leads us to the discussion of various *Bhāvas*.

(i) *Bhakti with kāntābhāva* :

What is meant by *kāntābhāva*? Here a devotee looks upon the Lord as husband and considers himself as his beloved. He undergoes experience of separation, etc. like a bride who undergoes such experiences. This *bhāva* brings the devotee nearer to the Lord.

This *kāntābhāva* is noticed in the lives of the followers of both the *Nirguṇa* and *Saguṇa Mārga*. However, this type of *Upāsanā* is not ideal for one,

who wants to follow the *Nirguṇa Mārga*. The best example of *kāntābhāva* is exemplified in the life of Mirabai.[7]

(ii) *Bhakti with gopībhāva* :

This is found to be prevalent in the works of the poets like Sūradāsa and Paramānandadāsa, who were the followers of the Vallabha Sampradāya. There is a reference to *sakhībhāva* as well, in the poetic works of these poets. It may, however, be noted that supreme importance is attached to *gopībhāva*. To cultivate *gopībhāva*, the devotee sings of the *Līlās* of *Gopīs* with Krishṇa and meditates on them. *Rāsalīlāpraveśa* is intended for the said purpose.

(iii) *Bhakti with sakhībhāva* :

Almost all the *Krishṇa Bhakti Sampradāyas* from *Vraja*, including *Vallabha Sampradāya*, have advocated *Madhurā Bhakti* with *sakhībhāva*, though they vary in certain respects.

Madhurā Bhakti with *sakhībhāva* is different from that performed with *kāntābhāva* and *gopībhāva*. Here the devotee neither considers himself to be the beloved of Krishṇa, nor does he like to sport with Krishṇa considering himself to be his *Gopī*.

The *upāsaka* of this *bhāva* struggles to achieve *sakhīpada* of Rādhā, who was beloved of Krishṇa. Through this he experiences that divine love, tasted by devotees, who consider themselves as bride of Krishṇa or a Gopī.[8]

Acharya Shukla has explained this in his work '*Sūradāsa*' more elaborately. He writes, "Bhaktas get absorbed in the *madhura rasa*, through the medium of relationship between Rādhā and Krishṇa, just as a reader enjoys *śṛiṅgāra rasa*, while reading the account of the relationship of love between a hero and a heroine in a poetic work."[9] However, it may be noted that the analogy should not be applied fully. Because, even though the *rasāsvādanapaddhati* may be common to both a devotee and a reader, it is not proper to infer therefrom that both experience the same state. Whereas a reader or a spectator is completely aloof from the drama and does not become a party to it, a devotee, who is devoted with *sakhībhāva*, becomes a part of the Divine *Līlā*, which he witnesses.

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